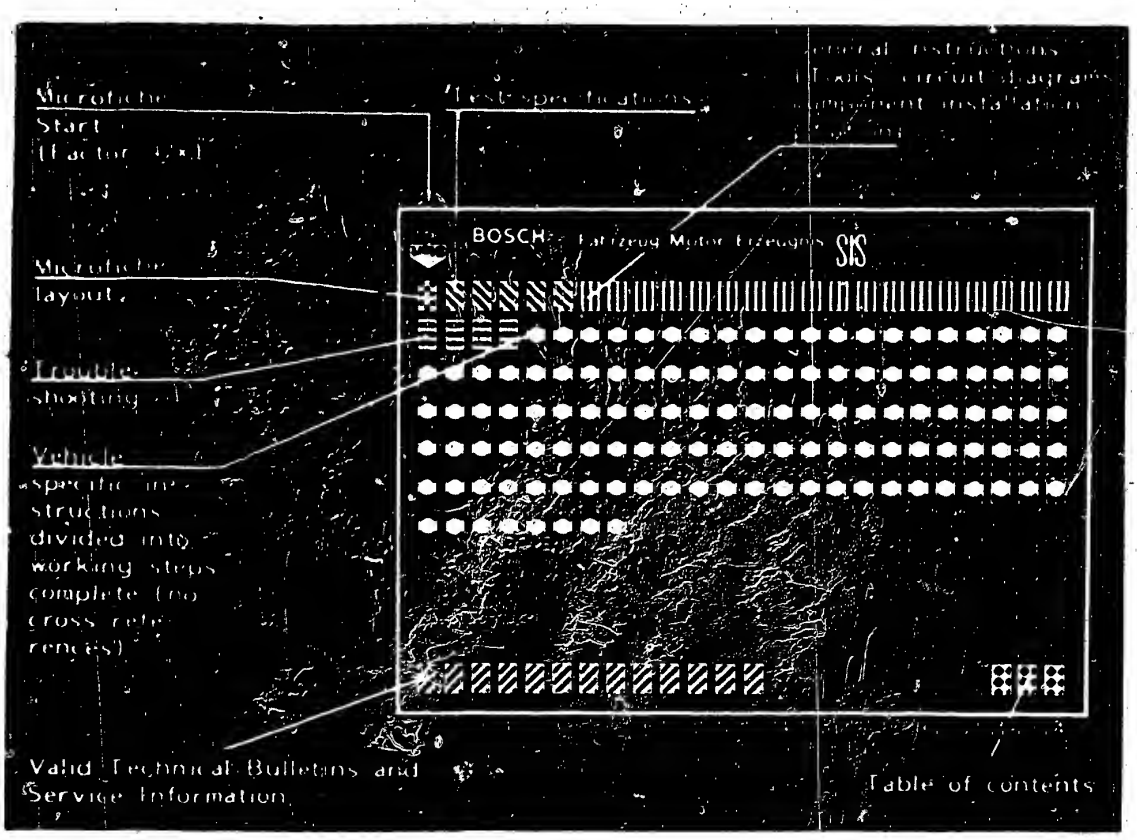
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

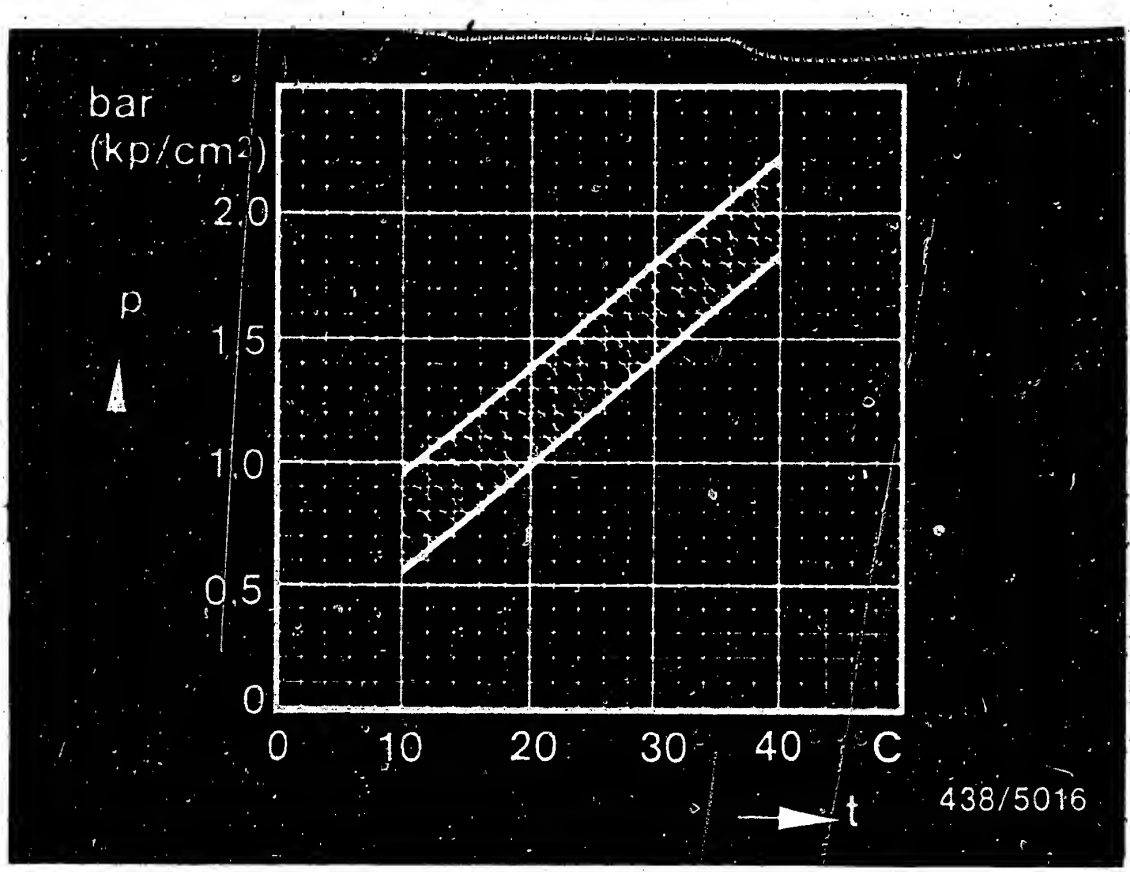
C6

1. Test specifications

1.1. Electric fuel pump

C1

Test step	Test specifications
Fuel delivery:	min. 850 cm³/30 s



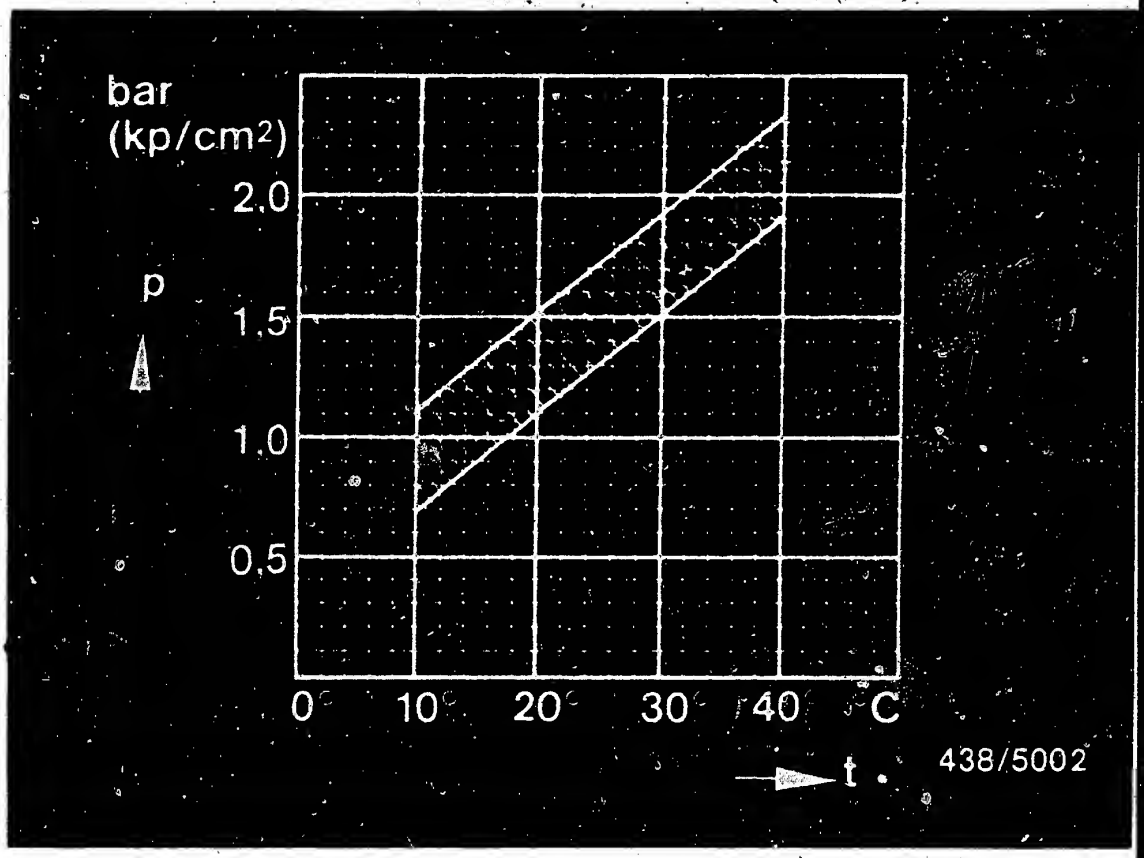
p = Control pressure (gauge pressure)
t = Ambient temperature

C15

1.2 Control pressure "cold"

- Part No. of warm-up regulator:

  0 438 140 065 up to FD 052
  0 438 140 100



p = Control pressure (gauge pressure)
t = Ambient temperature

Control pressure "cold"

- Part No. of warm-up regulator:
  0 438 140 065 as from FD 141

C15

Test step	Test specifications*	
1.3 Control pressure "warm"		C20
Warm-up regulator		
0 438 140 065	3.4...3.8 bar	
0 438 140 100	(3.5...3.9 kgf/cm²)	
1.4 Primary pressure		D1
Fuel distributor		
0 438 100 071, 0 438 100 091 — Checking value	4.7...5.4 bar (4.8...5.5 kgf/cm²)	
Setting value	4.9...5.1 bar (5.0...5.2 kgf/cm²)	
1.5 Leak test		D9
Minimum pressure		
after 10 minutes:	2.7 bar (2.8 kgf/cm²)	
after 20 minutes:	2.6 bar (2.7 kgf/cm²)	

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications*

E6

1.6 Injection valves

0 437 502 010

Opening pressure:	3.0...4.1 bar (3.1...4.2 kgf/cm²)

F3

1.7 Idle-speed adjustment[1)]

Note: Engine at operating temperature

Idle speed	700...800 min^{-1}
CO concentration	0.5...1.5 % by vol.

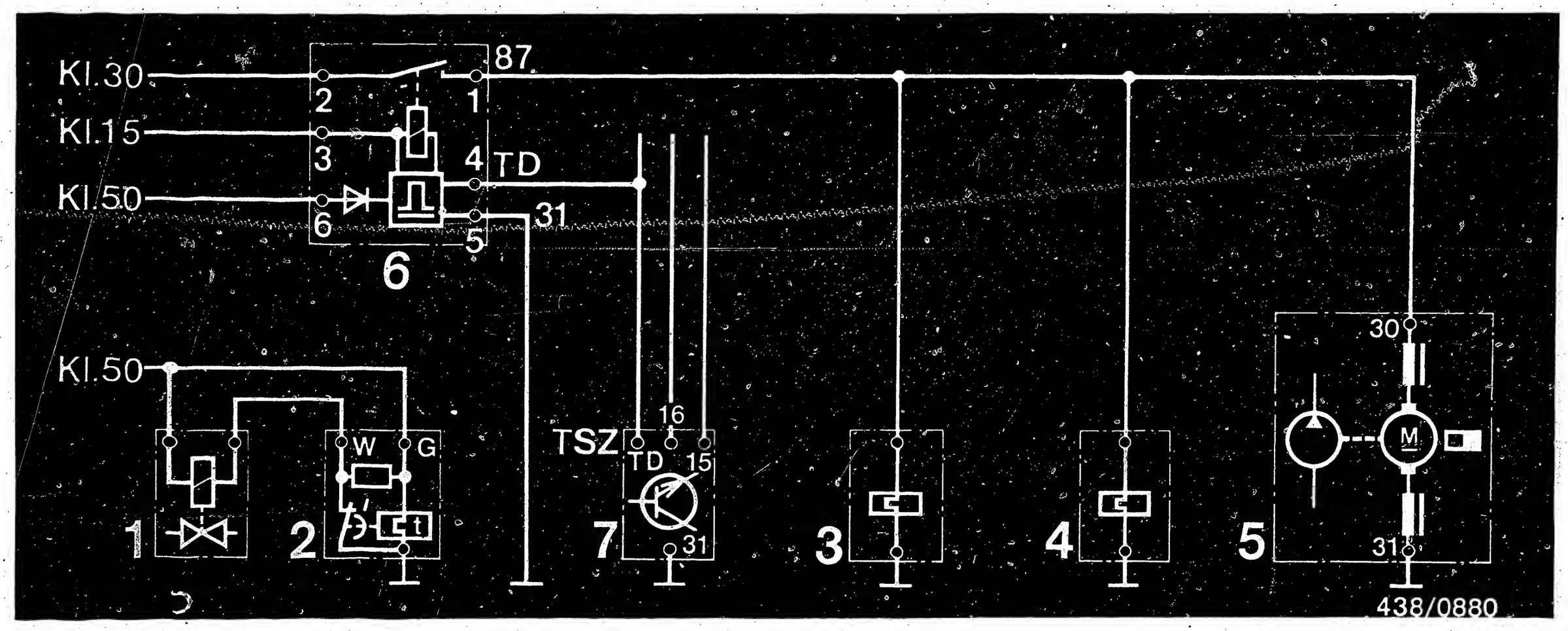
E15

1.8 Fuel distributor

Delivered-quantity comparison:	Setting point	Max. allowable delivery
Idle	6.0 cm³/min	6.6 cm³/min
Part load	30.0 cm³/min	34.0 cm³/min
Full load	100.0 cm³/min	110.0 cm³/min
With max. deflection of sensor plate	130.0 cm³/min	145.0 cm³/min

*Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

1) In vehicles of the Australia and Sweden version switch off the emission control systems, exhaust-gas recirculation, secondary air injection and overrun bypass air valve.



1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Electric fuel pump
6 = Electronic relay
7 = Trigger box of transistorized ignition system (TCI)

2. Electrical safety circuit

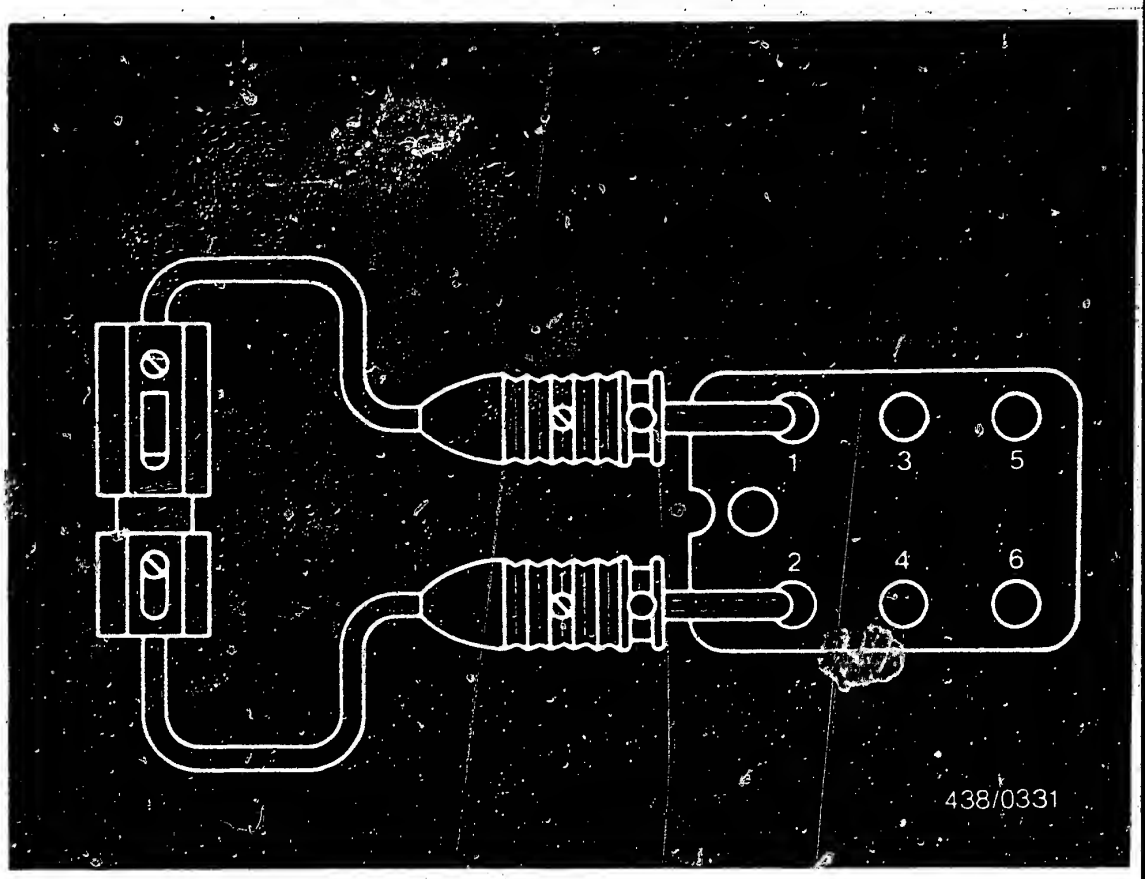
2.1 Design up to 1981 model year

- Circuit diagram

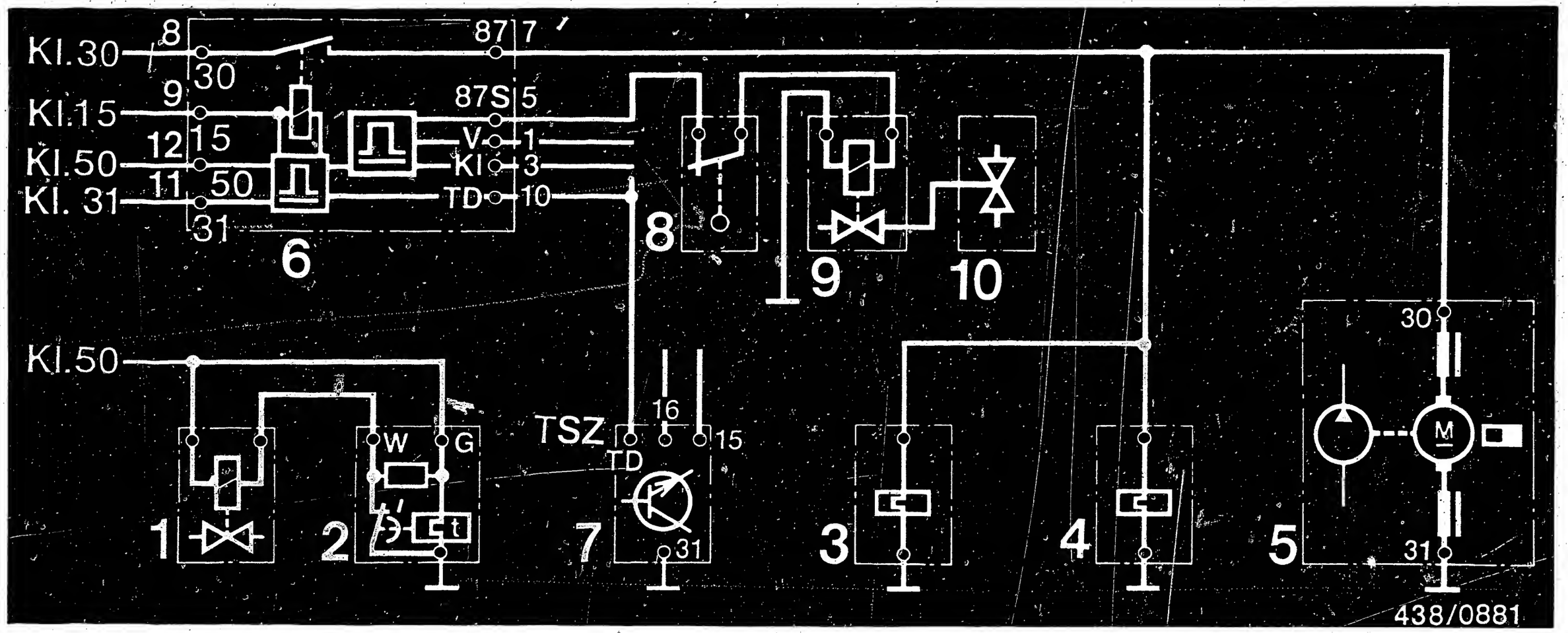
The safety circuit employs an electronic relay which is energized from terminal TD of the trigger box of the transistorized ignition system.
Additional function of the relay: Protection against overrevving. At an engine speed of 6100 min^{-1} the electric fuel pump is switched off to limit the engine speed.

• Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit.
To do this, remove the cap (Item 1), positioned on the left-hand side in front of the firewall in the engine compartment, and pull the electronic relay out of its base.



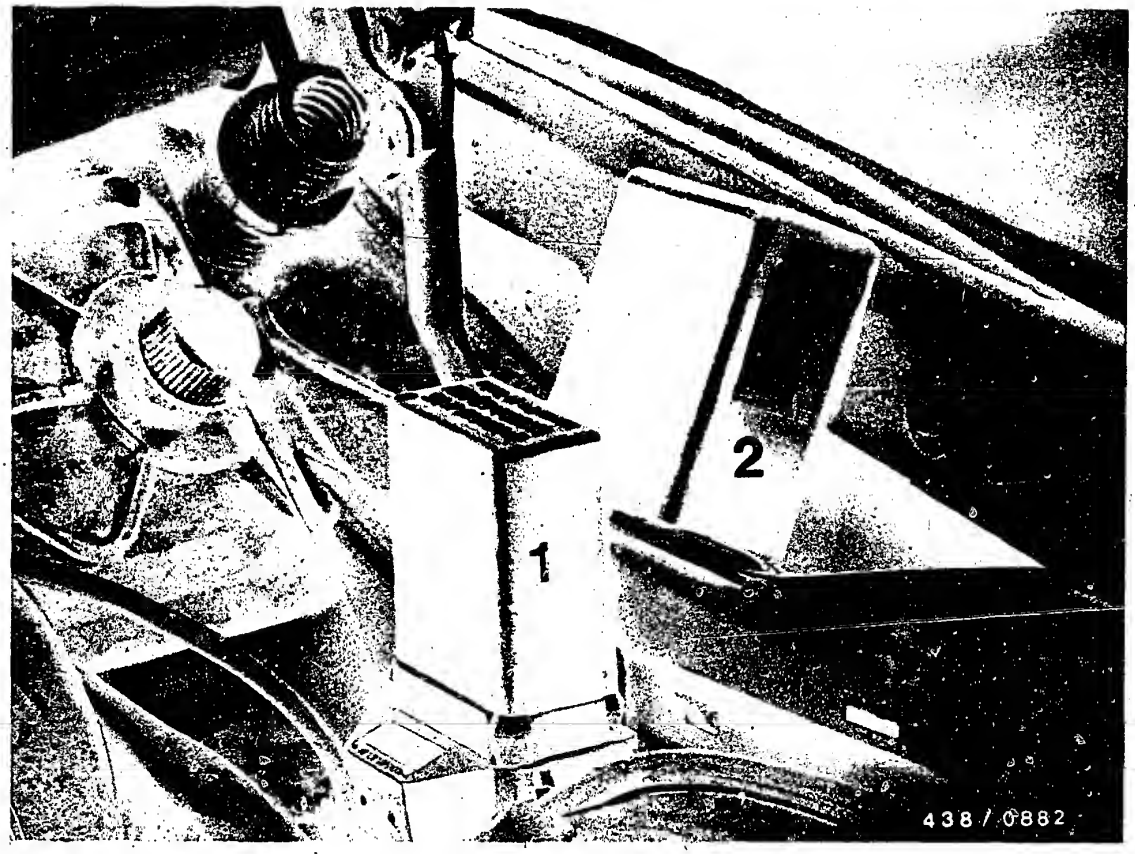
Connect sockets 1 (87) and 2 (30) in the base.
Use connecting cable 1.5 mm² with fuse holder and 16 A fuse (to be user-fabricated according to sketch).
Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.



1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Electric fuel pump
6 = Electronic relay
7 = Transistorized ignition trigger box (TCI)
8 = Throttle-valve microswitch
9 = Change-over valve
10 = Cut-off valve

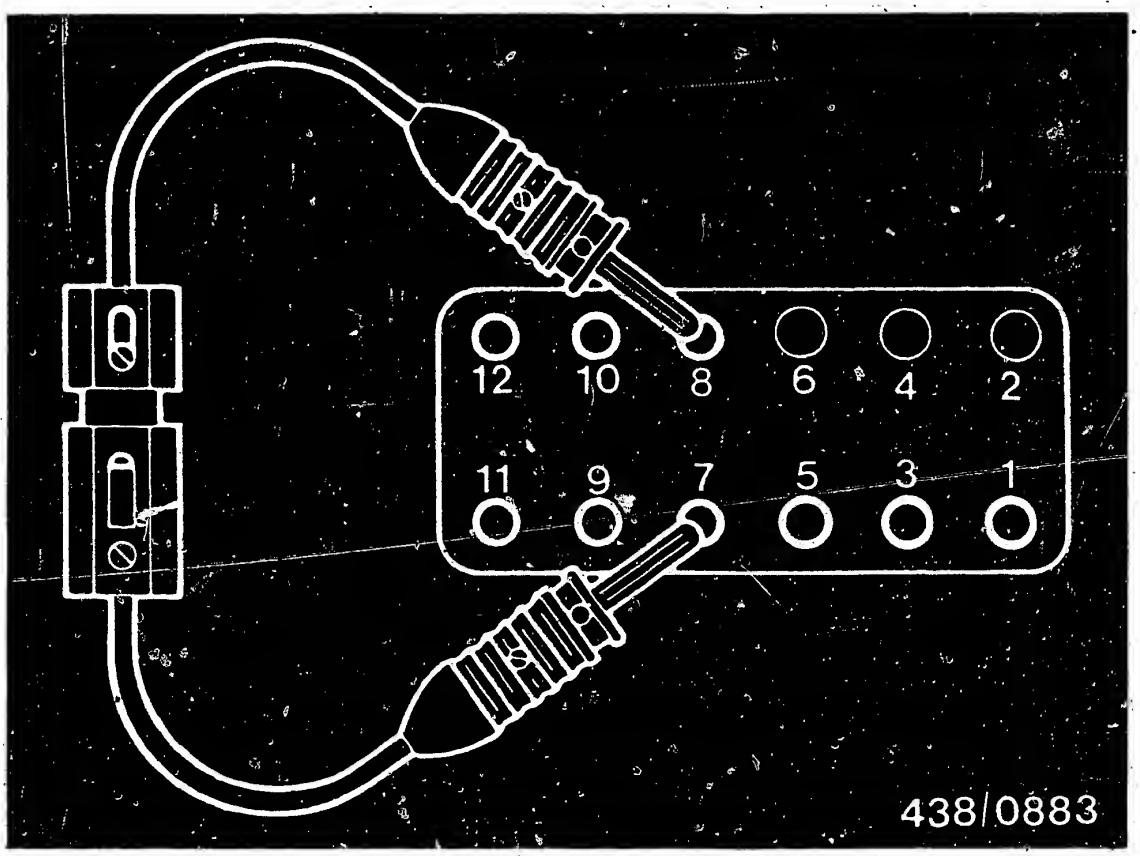
2.2 Design as of 1982 model year (with overrun cut-off)

• Circuit diagram
The safety circuit, with electronic relay, is energized from terminal TD of the transistorized ignition trigger box.
Additional functions of the relay: Protection against overrevving and overrun cut-off.
At an engine speed of 6200 min^{-1} the electric fuel pump is switched off to limit the engine speed.
The fuel overrun cut-off acts on the overrun above an engine speed of 1300 min^{-1} and a road speed greater than 30 km/h.



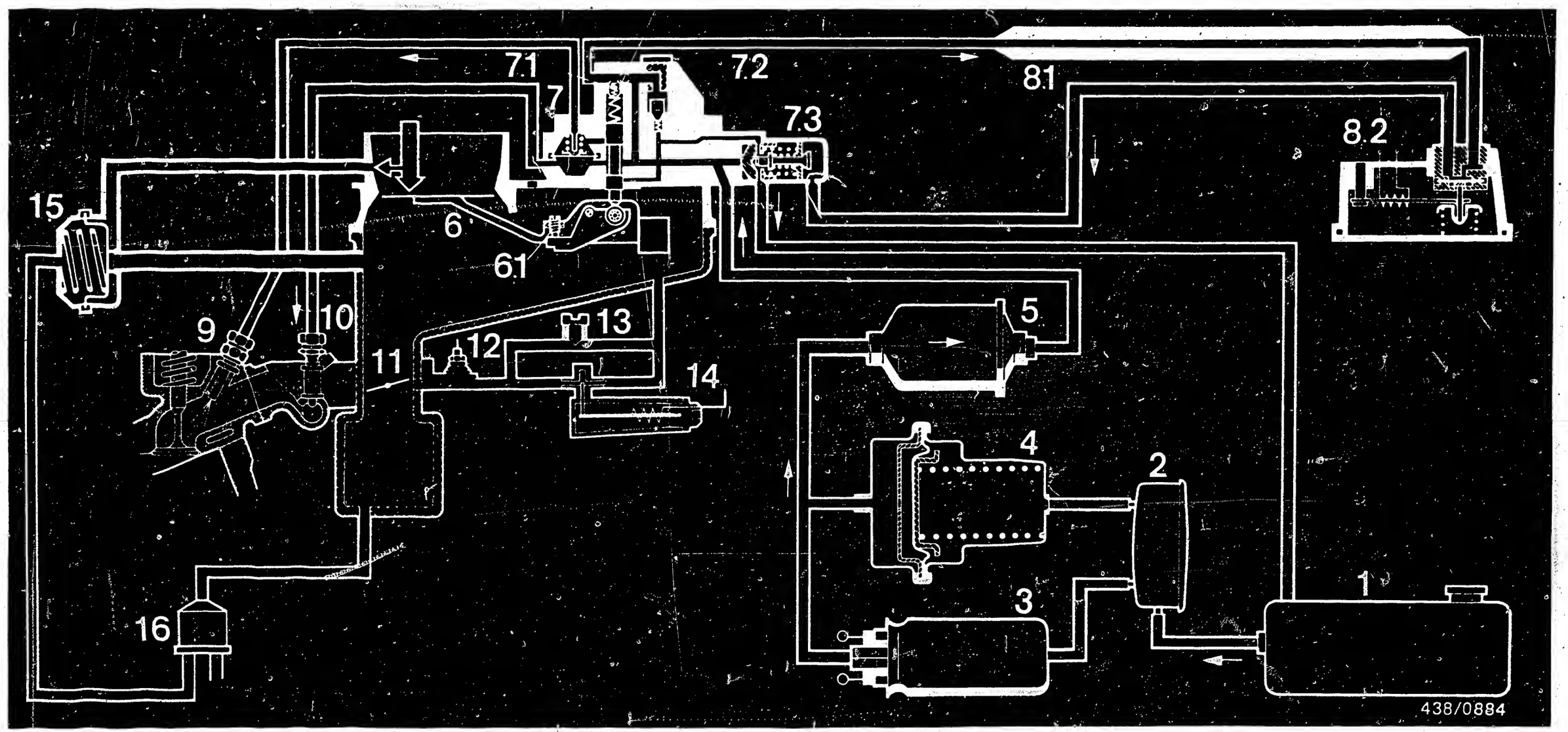
- Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit.
To do this, remove the cap (Item 2), positioned on the left-hand side in front of the firewall in the engine compartment, and pull the electronic relay (1) out of its base.



1 = From speedo-generator
2 = (Not occupied)
3 = From air conditioner
4 = (Not occupied)
5 = Throttle-valve switch
6 = (Not occupied)
7 = To warm-up regulator, auxiliary-air device and electric fuel pump
8 = From battery
9 = From ignition switch
10 = From ignition trigger box
11 = From vehicle ground
12 = From starting switch

Connect pins 7 (87) and 8 (30) in the plug socket. Use connecting cable 1.5 mm² with fuse holder and 16 A fuse (user-fabricated as per sketch).
The electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.



3. Diagram of fuel lines (with overrun cut-off as of 1982 model year)

1 = Fuel tank
2 = Intake noise damper
3 = Electric fuel pump
4 = Fuel accumulator
5 = Fuel filter
6 = Downdraft air-flow sensor
6.1 = Idle-mixture-adjusting screw
7 = Fuel distributor
7.1 = Compression spring
7.2 = Pressure-relief valve
7.3 = Push-up valve
8.1 = Damping control-pressure line
8.2 = Warm-up regulator
9 = Injection valve
10 = Start valve
11 = Throttle valve
12 = Thermo-time switch
13 = Idle bypass screw
14 = Auxiliary-air device
15 = Overrun cut-off valve
16 = Change-over valve

4. General information

4.1 Introduction

The following vehicles are supplied with the 2.3 l/ 4-cylinder engine (Type 102...) with K-Jetronic:

Vehicles:	Type:
230 E, 230 CE, 230 Te	123...

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 1 - B 4 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

4.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

4.3 The following components are different or extra:

- Intake-noise damper in the fuel intake line (for preventing intake noises) between fuel tank and electric fuel pump.
- Electric fuel pump with replaceable non-return valve.
- Fuel accumulator with doubled storage volume (40 cm^3) and only one connection on the accumulator side. The spring chamber is not vented to the atmosphere but is connected to the fuel intake line via a hose to the intake-noise damper.
- 4-cylinder mixture-control unit with downdraft air-flow sensor.
- Fuel distributor with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines.
  This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-Sales Service Organization. For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model. The screw plugs must not be removed or loosened.

- Fuel distributor with integral pressure-relief valve (on control-pressure dome).
  Below 0.3 bar gauge pressure in the fuel system this valve opens to the return as a result of which the gauge pressure drops to 0 bar.
  This prevents the control plunger in the fuel distributor from possibly being sucked up as the engine cools down. In addition, a compression spring is installed above the control plunger.
- Strainer in the double fitting of the fuel distributor and warm-up regulator inlet.
- Electrical safety circuit for electric fuel pump, warm-up regulator and auxiliary-air device through electronic relay.
- Overrevving protection device switches the electric fuel pump off at high engine speeds.
  Cut-off speed:
  up to 1981 model: 6100 min^{-1}
  as of 1982 model: 6200 min^{-1}
- The overrun cut-off fitted as standard as of the 1982 model operates on the overrun above an engine speed of 1300 min^{-1} and a road speed greater than 30 km/h.
  Relevant components:
  Overrun cut-off valve, change-over valve, throttle-valve microswitch, speedometer pulse generator, engine-speed relay (integrated in relay of safety circuit).

4.4 Vehicle types

Vehicles of the Australia and Sweden version are equipped with exhaust-gas recirculation, secondary air injection and overrun bypass air valve.
During trouble-shooting and adjusting, particularly during the idle adjustment, the influence of these emission control systems should be borne in mind.

5. Test equipment and tools

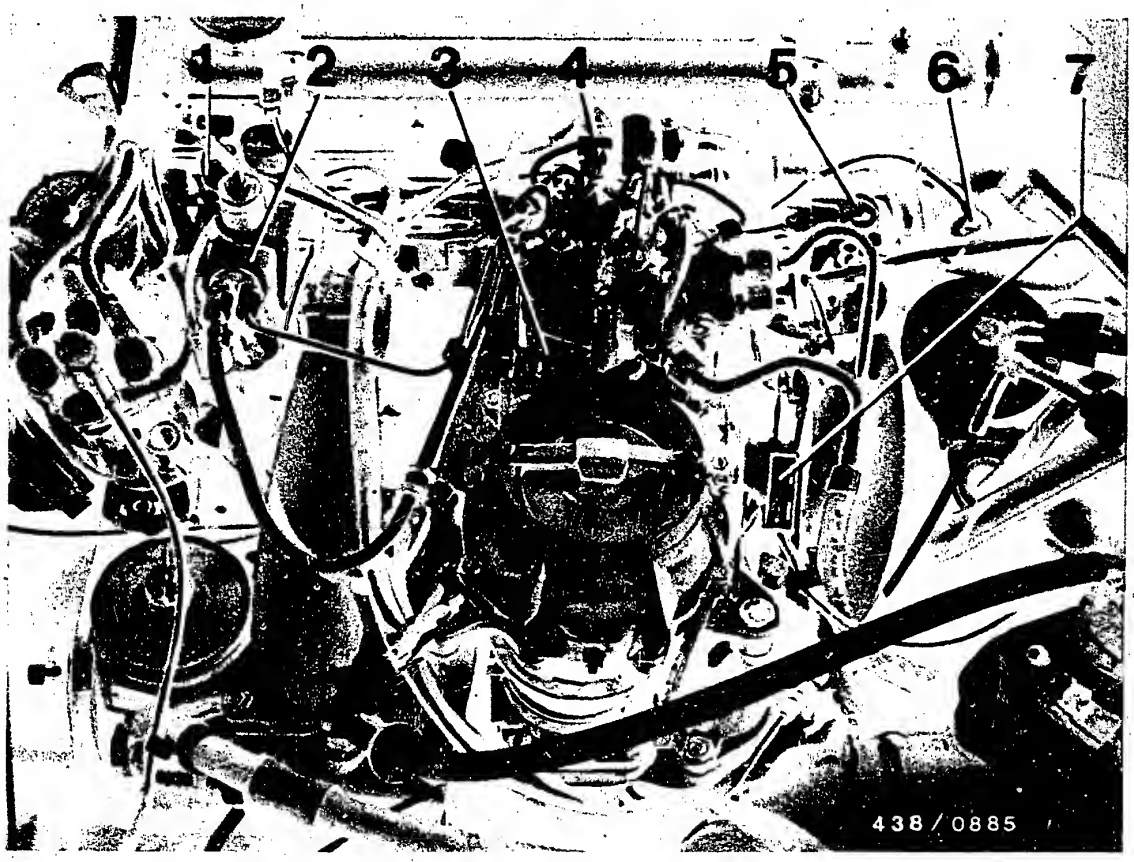
- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.
- Connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).
  For connecting pressure tester to the control-pressure port of the fuel distributor.
- Adjusting wrench KDEP 1035.
  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).
- Guide ring KDEP 1040/10 (dia. 80 mm)
  For centering the air-flow sensor plate in the air-flow sensor.
- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.
- Line set KDJE-P 200/25 (previously 7451/25).
  For connecting the tester for delivered quantity comparison to the K-Jetronic in models with steel fuel-injection tubing.
- Graduate (commercially available, capacity approx. 1.5 l)
  For measuring the delivery of the electric fuel pump.
- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.
- TORX offset wrench size TX 730 (commercially available)
  For unscrewing the screw plug of the pressure release valve out of the fuel distributor (up to 1981 model)

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor (e.g. No. 131 090 from the firm Cartool, Hans Schubert KG, Unterer Grasweg 88, D-8070 Ingolstadt).
- Valve tester KDJE-P 400 (previously KDJE 7452). For testing the injection valves.

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or Bosch, Part Designation VS 14 942-CH previously Part No. 5 973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

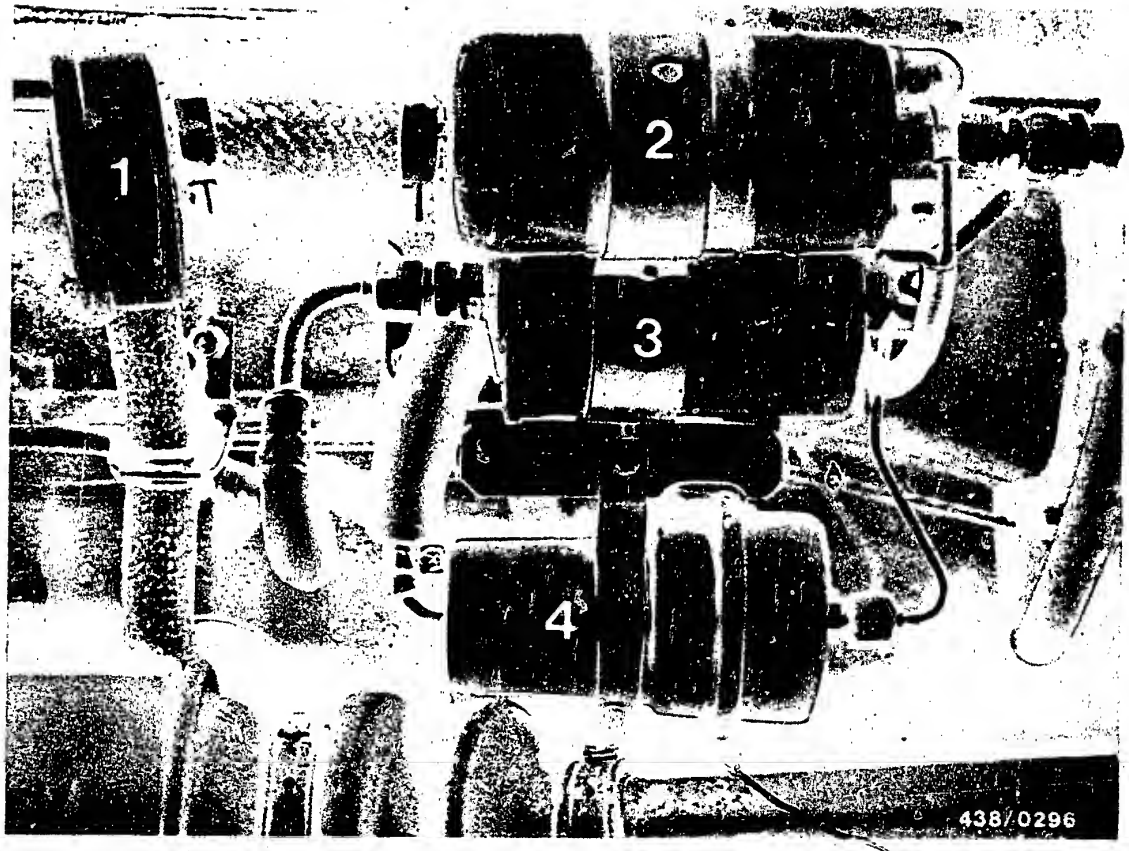
- Tachometer (commercially available)
  For idle-speed adjustment
- CO meter (commercially available)
  For idle-speed CO adjustment
- Setting device KDJE 7456
  For deflecting the air-flow sensor plate (down-draft air-flow sensor) during comparative measurement of fuel deliveries from fuel-distributor outlets.



1 = Thermo-time switch
2 = Warm-up regulator
3 = Mixture-control unit
4 = Start valve
5 = Injection valve
6 = Auxiliary-air device
7 = Throttle-valve micro-switch
(as from 1982 model for overrun fuel cut-off)

6. Installation position of components

6.1 Arrangement of components on the engine (air-filter removed)



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

6.2 Fuel-supply components

Intake-noise damper, electric fuel pump, fuel filter and fuel accumulator are fastened on a support piece underneath the vehicle on the right-hand side above the rear axle.
These components are protected against road dirt by a dirt deflector (removed in the picture).
The connections of these components should be thoroughly cleaned before opening.
Before loosening the connections, pinch-off intake hose of electric fuel pump so that no fuel can escape (e.g. using hose clamper W 157 from Matra Co.).

Symptom

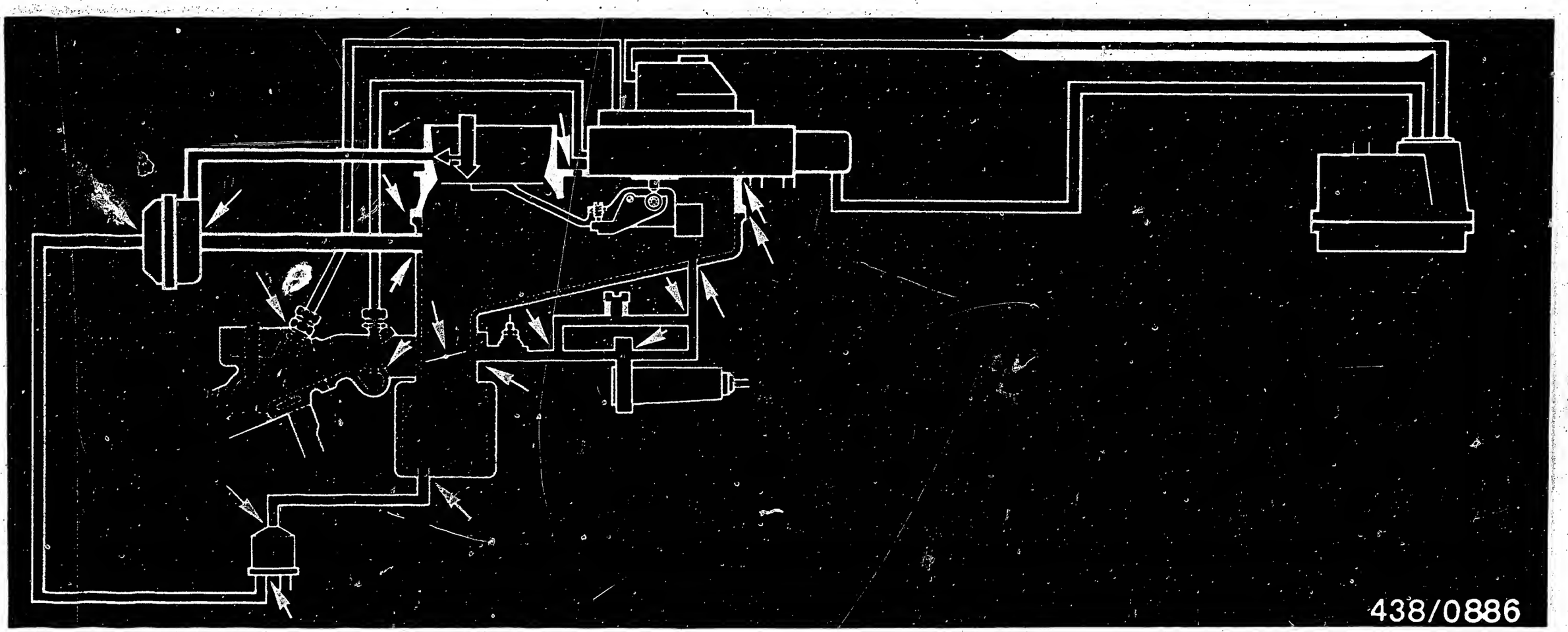
1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition*
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires when operating on the road, high load
7. Insufficient power

1	2	3	4	5	6	7	Cause	Coordinate
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B17
●		●					Auxiliary-air device does not open	B23
	●	●	●	●		●	Overrun cut-off not O.K. (as of 1982 model)	F13
●	●				●		Electric fuel pump not operating	C 1
●							Cold-start system defective	C 4
		●	●				Cold-start valve leaking	C 6
				●			"Cold" control pressure outside tolerance	C15
●		●					"Warm" control pressure too high (after warm-up)	C20
	●		●	●	●	●	"Warm" control pressure too low (after warm-up)	C20
			●	●		●	Primary (system) pressure outside tolerance	D 1
					●	●	Overall fuel system leaking	D 9
	●						Injection valves leaking, opening pressure too low	E 6
●	●	●	●		●		Unequal fuel delivery (imbalance of fuel delivery)	E15
●	●	●	●			●	Basic CO adjustment incorrect	F 3
●	●	●	●	●			Throttle plate does not open completely	F 4

*Note
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinate L 4/L 5.

Symptom

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinate
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	B 8
●							Position of the air-flow sensor plate incorrect	B17
					●		Auxiliary-air device does not close	B18
	●	●		●		●	Overrun cut-off not O.K.	F13
						●	Electric fuel pump not operating	C 1
●	●			●			Cold-start valve leaking	C 6
		●				●	Excessive delivered fuel quantity for control-pressure circuit	C 8
		●				●	"Warm" control pressure too high (after warm-up)	C20
	●	●	●			●	"Warm" control pressure too low (after warm-up)	C20
		●				●	Primary (system) pressure outside tolerance	D 1
●							Injection valves leaking, opening pressure too low	E 6
		●					Unequal fuel delivery (imbalance of fuel delivery)	E15
●	●	●	●	●			Basic CO adjustment incorrect	F 3



Test steps

8. Testing the air-intake system (vacuum system) of the engine for leaks

The arrows in the picture show the typical points at which leaks can occur.
Test by means of a visual examination or, if in doubt, proceed as follows: Remove the hose from the outlet of the auxiliary-air device and blow air into the intake system through this hose with a compressed air gun. Open the throttle valve fully while doing this. Brush joints with soapy water or spray with leak detector (e.g. Güpoflex).

Under no circumstances use combustible liquids when testing for leaks.

Bubbling or foaming indicates a leak.
When a leak has been eliminated, carry out the idle adjustment with the engine at normal operating temperature:
Idle adjustment is described on Coordinate F 3.

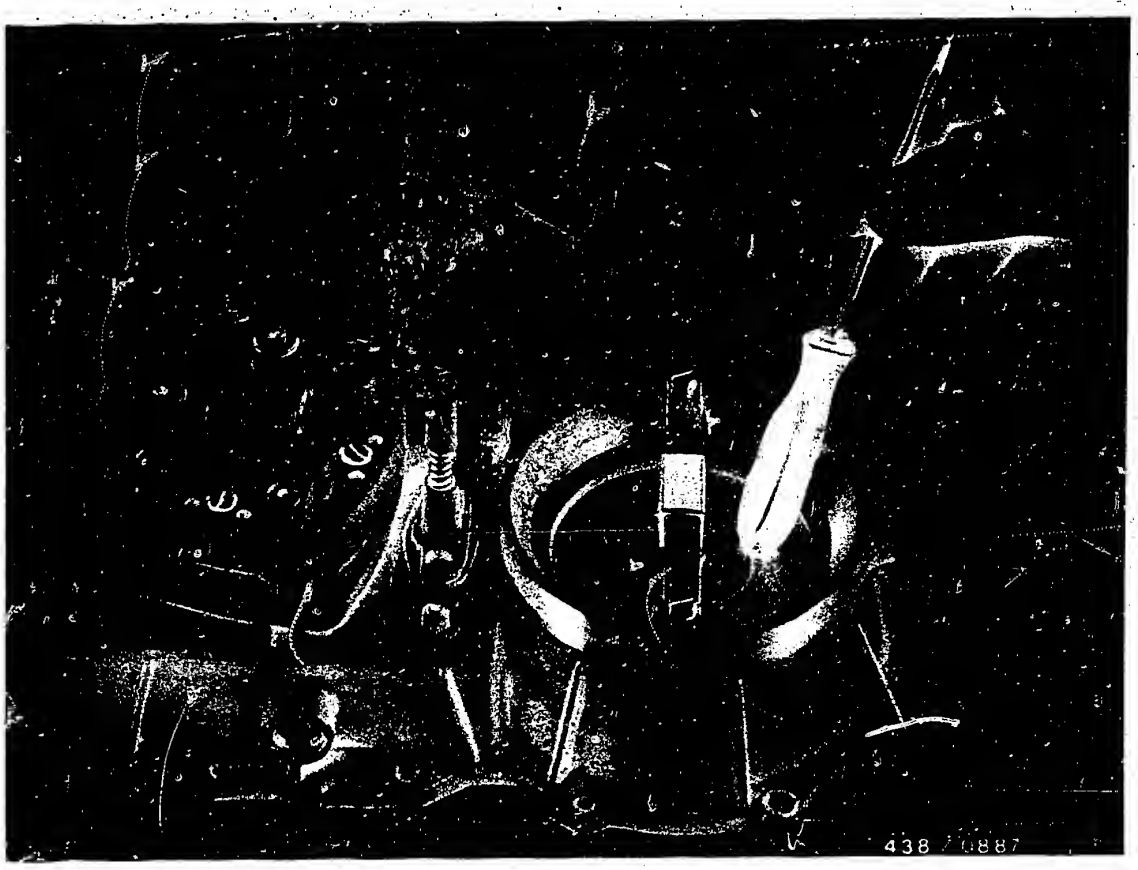
9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement

9.1 Preparations

- Engine temperature not below +20°C.
- Remove the air filter so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.

9.2 Check that the control lever moves freely

Press down the air-flow sensor plate by hand (down-draft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem. If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Mercedes-Benz service part). Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgf/m).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand (downdraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially loses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

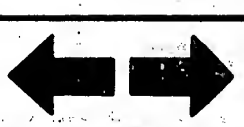
Important!

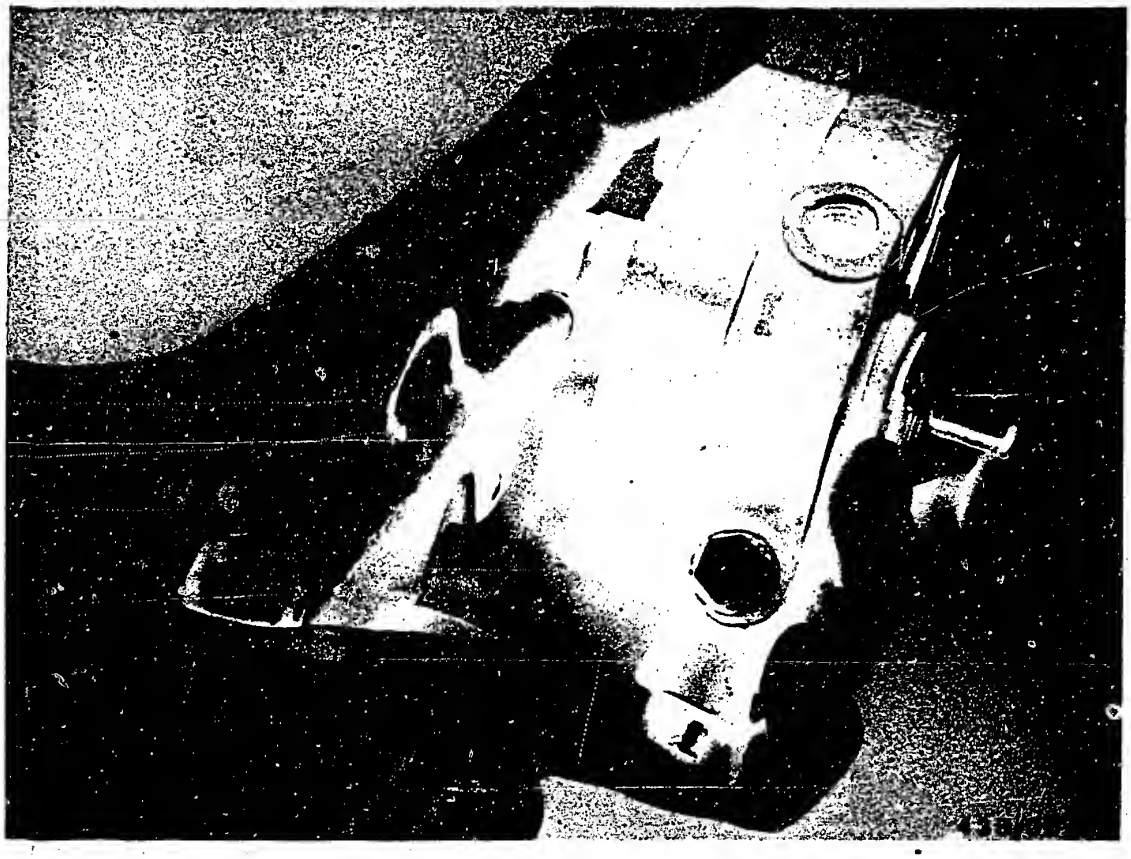
Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

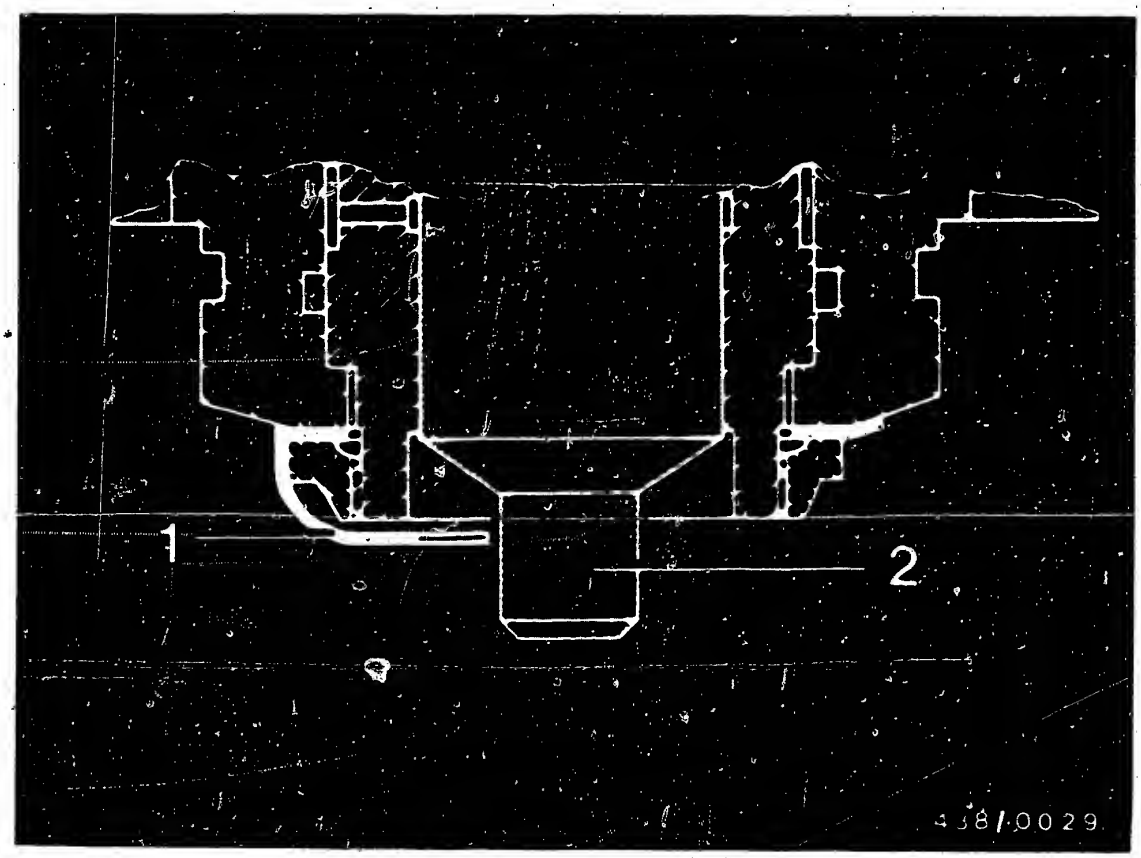




Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.
The steel tubing must not be bent!

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.

Caution:
Fuel distributors with an integral pressure-relief valve are additionally equipped with a helical compression spring above the control plunger.
Pay attention to the compression spring when removing the control plunger and remember to fit it again when re-assembling.



1 = Anti-drop-out device
2 = Control plunger

9.4 Fuel distributor with anti-drop-out device for the control plunger

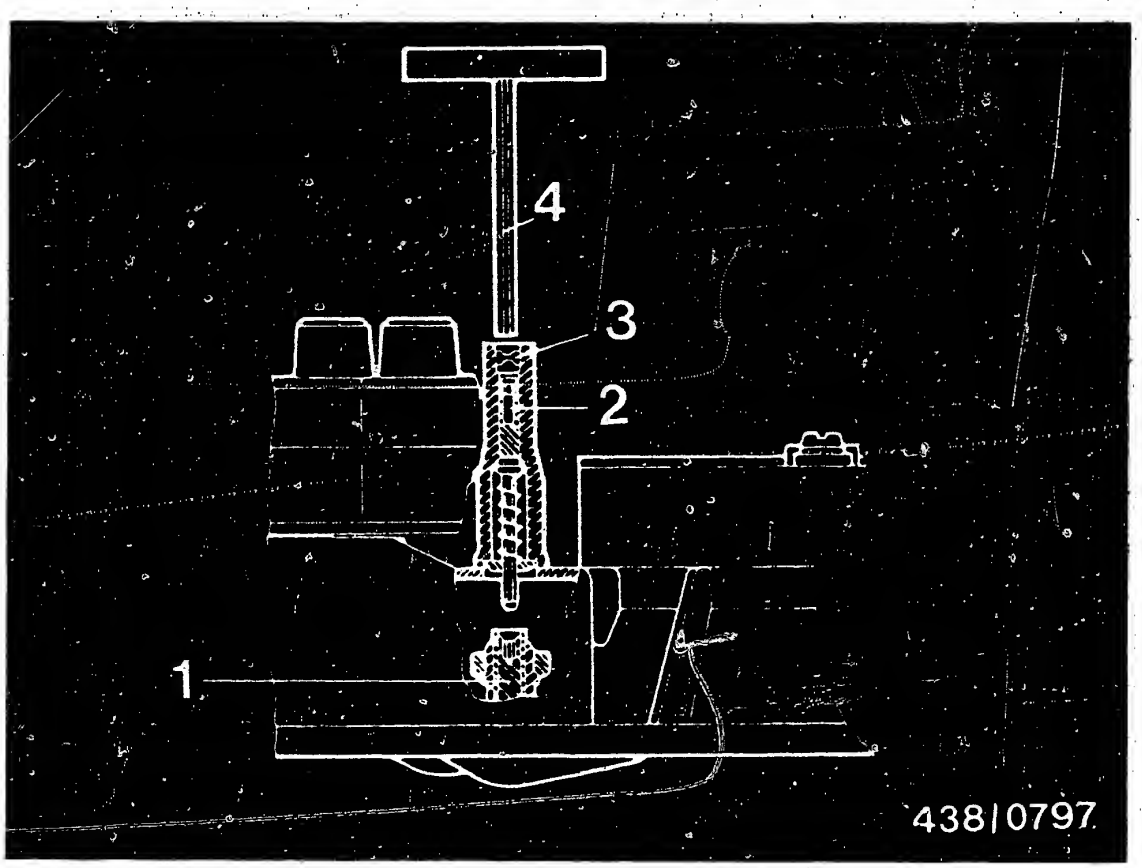
Caution!
The fuel distribitors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.
The anti-drop-out device must not be removed!

9.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

When connecting the fuel-injection tubing, use new seal rings.

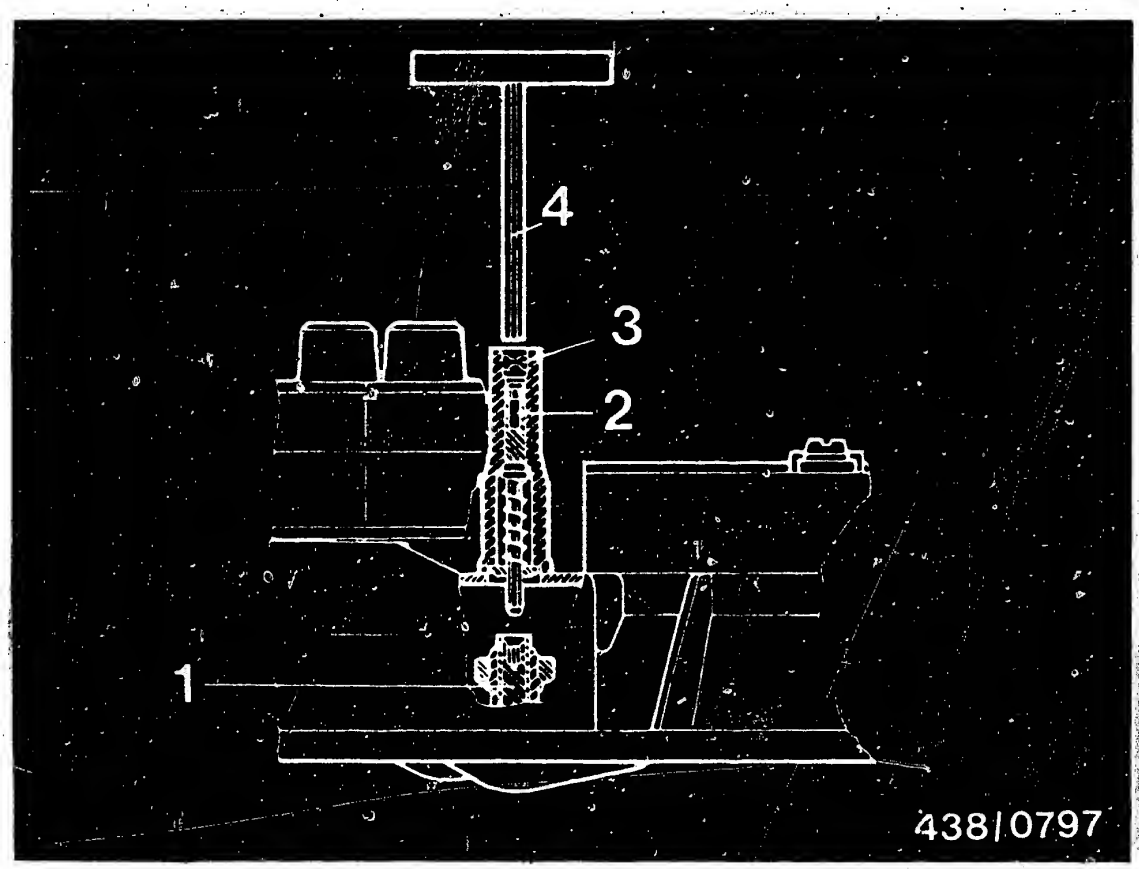
Caution:
The connection screws of the fuel-injection lines on the fuel distributor should be tightened to a torque of 10...12 Nm (1...1.2 kgfm); if tightened too much, there is the danger that the lines may be crushed.



1 = Idle-mixture-adjusting screw
2 = Adjusting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

9.6 Matching the fuel distributor to the air-flow sensor for initial starting:

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.



1 = Idle-mixture-adjusting screw
2 = Setting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

Remove anti-tamper device (lead seal) for idle-mixture adjusting screw.
To make the adjustment, carefully press down the pin wrench of the setting device using adjusting wrench KDEP 1035 (4) until it locks in position in the idle-mixture-adjusting screw (1).
Remove the adjusting wrench after each adjustment.
The pin wrench is forced upward by the built-in spring and automatically closes the bore to the idle-mixture-adjusting screw through an O-ring seal.

Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

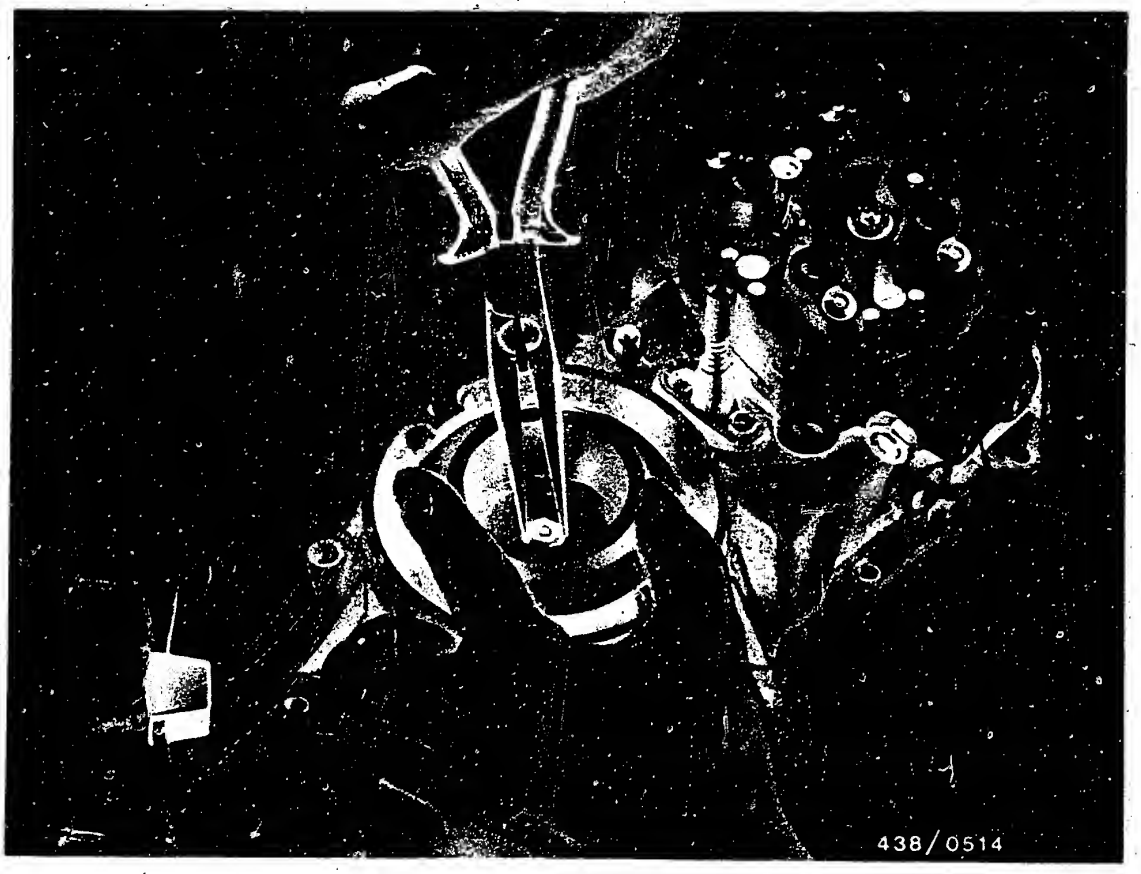
The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate F 3.

10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

- Engine temperature is not important.
- Remove the air filter so that the air-flow sensor plate becomes accessible.

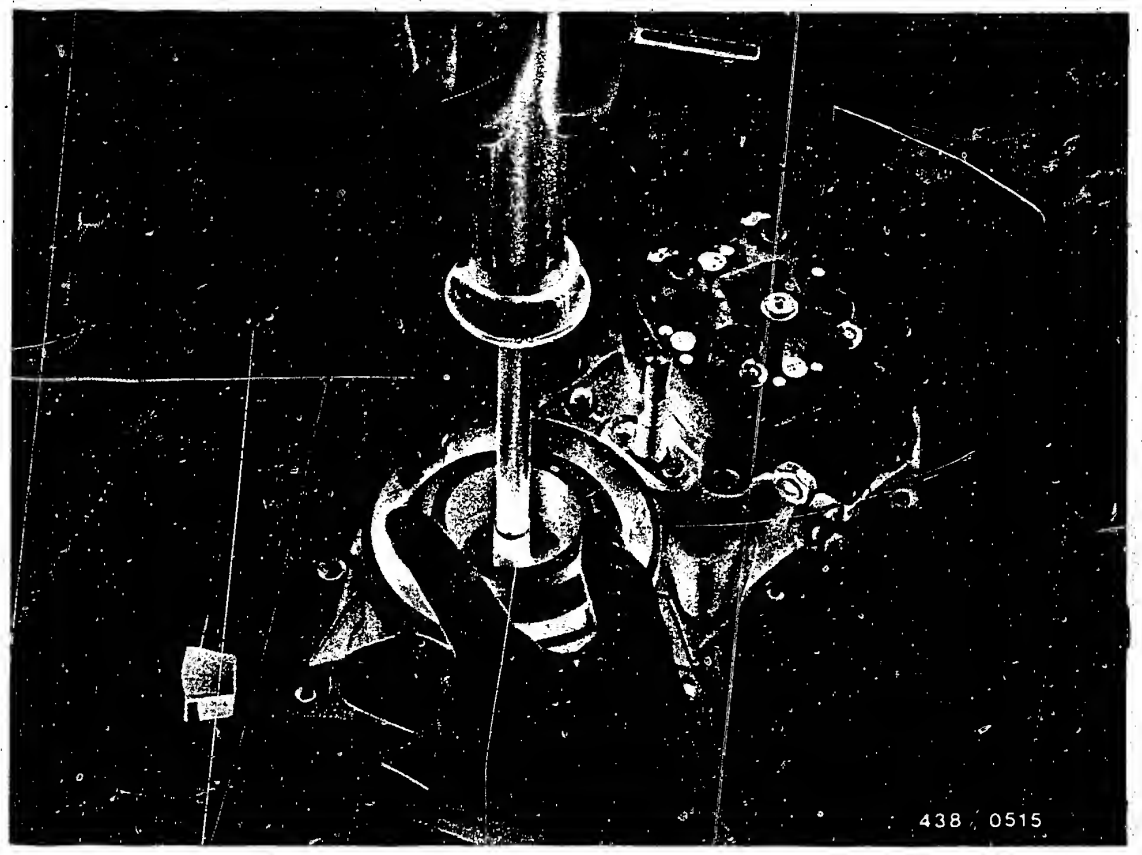


10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Remove the stop bracket after loosening the two fastening screws.

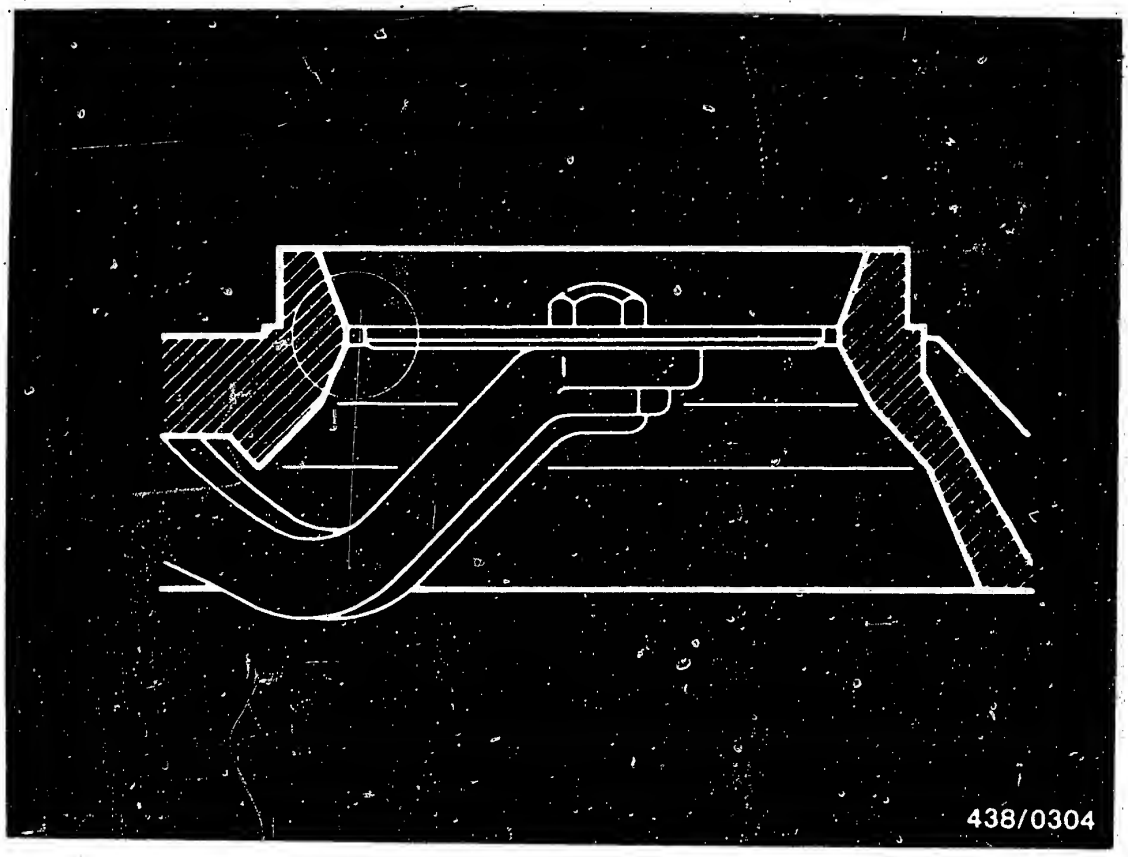
Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.

When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

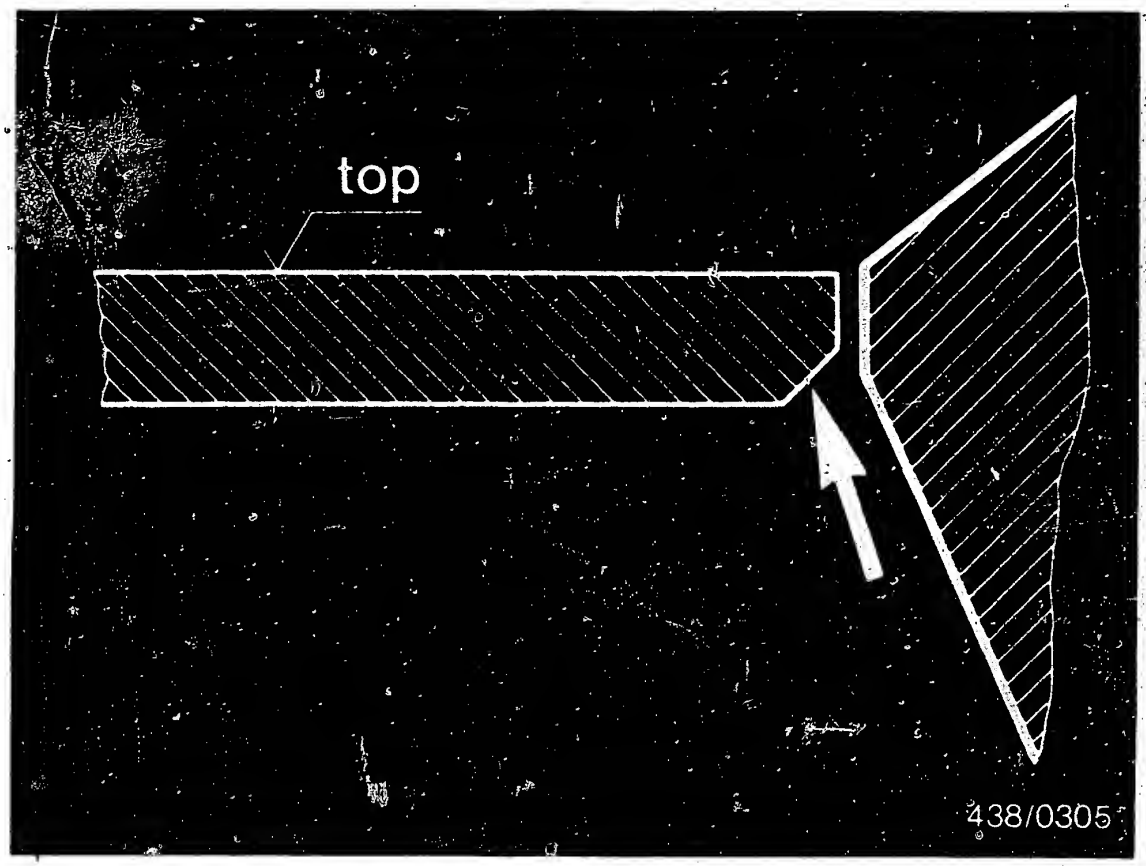


10.3 Checking and adjusting the zero position of the sensor plate
(Rest position):

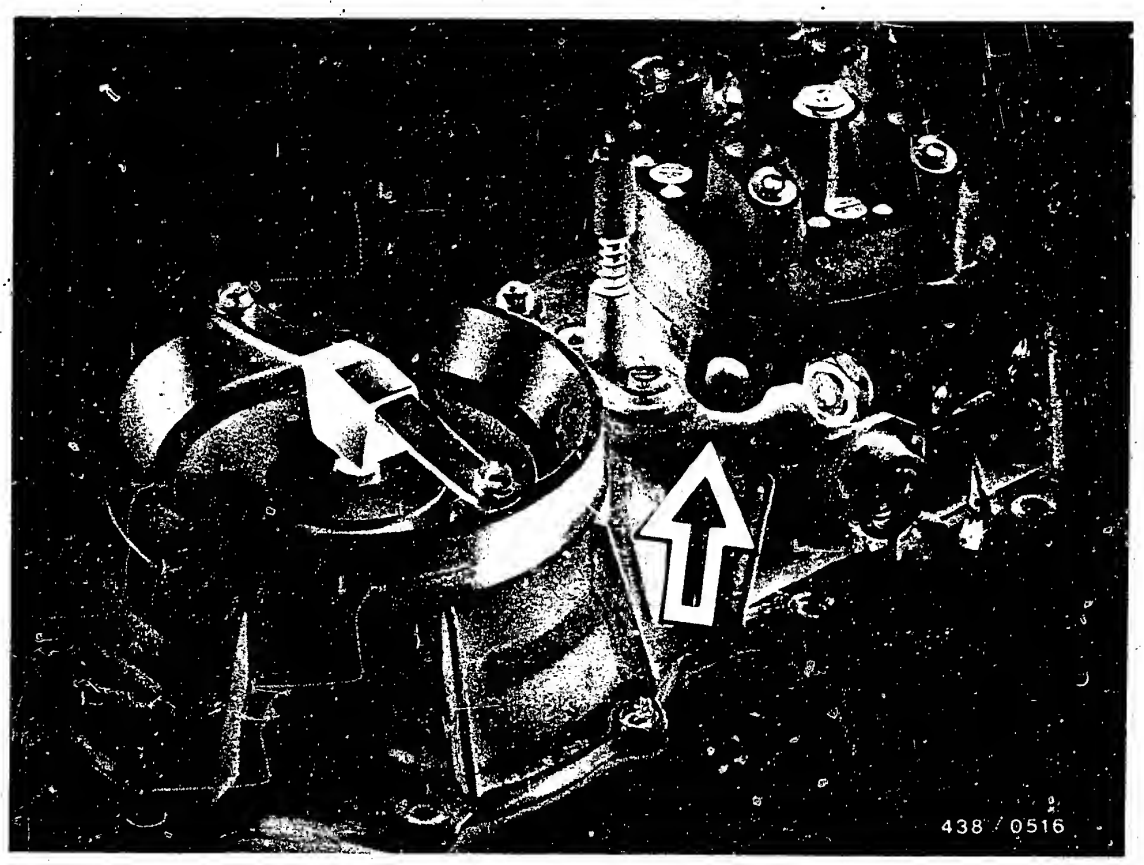
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone (relief funnal, top) or max. 0.5 mm higher.

The air-flow sensor plate must be flat and must not project at any point on its circumference outside the cylindrical part of the air funnel.

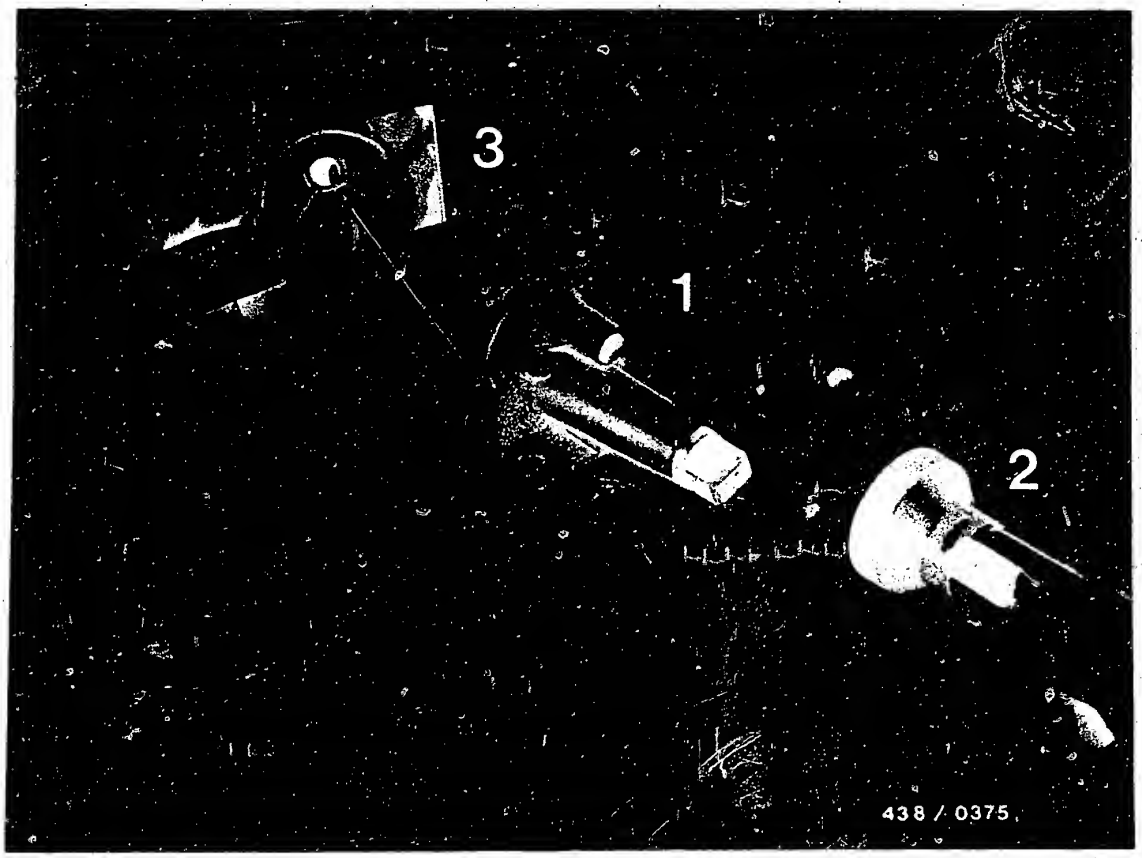


Caution:
The lower edge of the sensor plate is partially chamfered. Be absolutely sure that this chamfered edge is on the bottom (arrow). The upper side of the sensor plate is (in some cases) marked by the word "top".



If the sensor plate is positioned too high, an adjustment can be made. To do this, drive the guide pin (arrow) for the leaf-spring limit-stop deeper using a mandrel and a light hammer.

Caution!
Make this adjustment very carefully so that the guide pin is not driven in too far.
Be absolutely sure to avoid repeated adjustments in both directions because this can loosen the press fit of the pin. Serious engine damage can result if this pin should drop out.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device.

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device.
Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.

- Fit the electric cable plug on the auxiliary-air device.

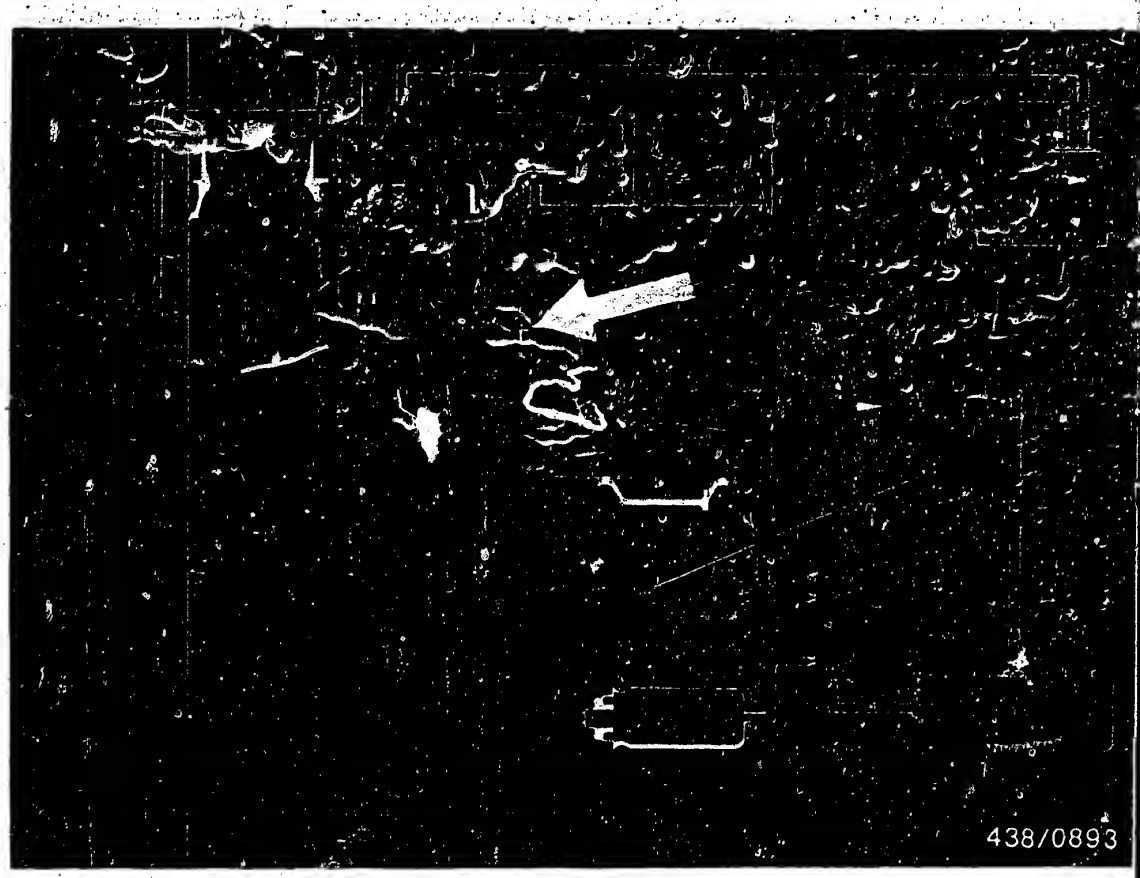
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.

- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

- Replace the auxiliary-air device if defective.

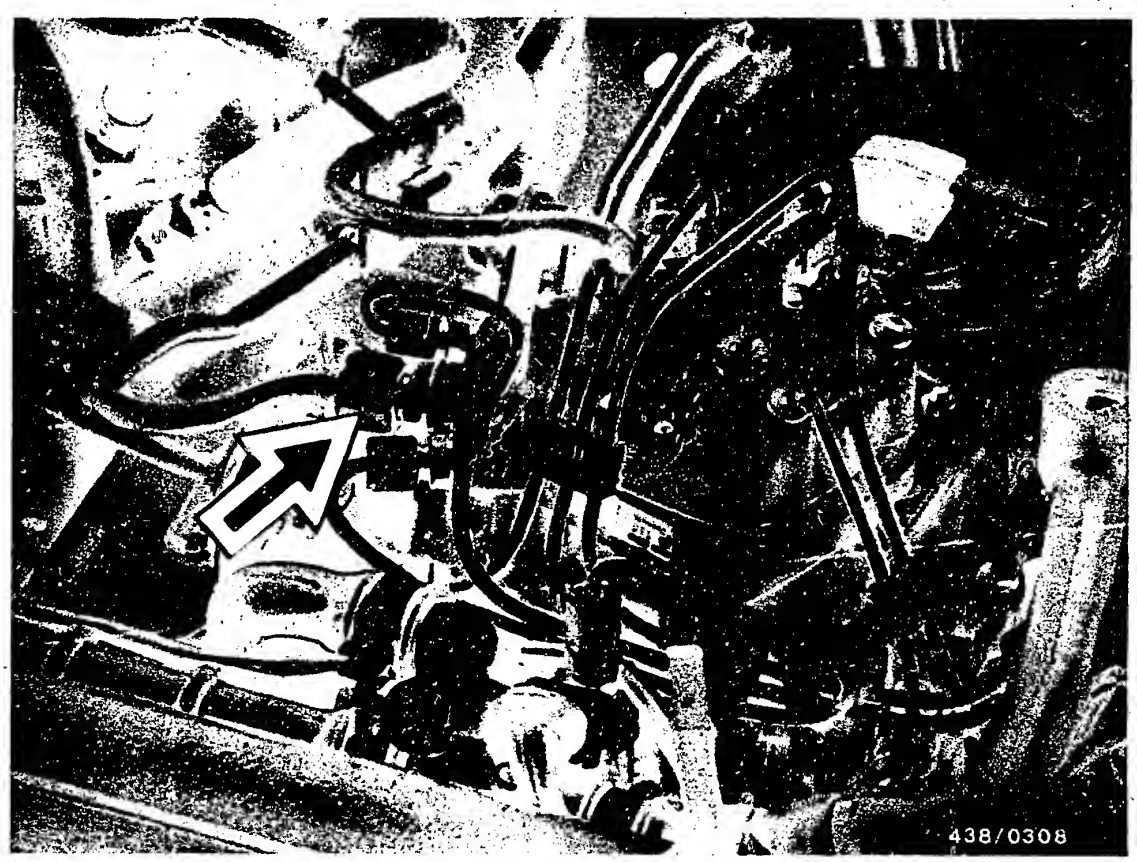
When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates F 3.



12. Checking the operation of the electric fuel pump.

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point

A suitable measuring point for fuel-delivery testing is the return port (arrow) on the fuel distributor.
Unscrew the fuel return line from the fuel distributor. Equip a test hose (minimum inside diameter 8 mm) with a ball-type union and union nut M 14 x 1.5 and connect to the return port of the fuel distributor.
Hold the end of the hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

12.3 Checking:

Pull off the plug from the warm-up regulator and auxiliary-air device. Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in a graduate.

12.4 Test specification:

Fuel delivery: at least 850 cm^3/30 seconds.

12.5 Possible causes of insufficient fuel delivery:

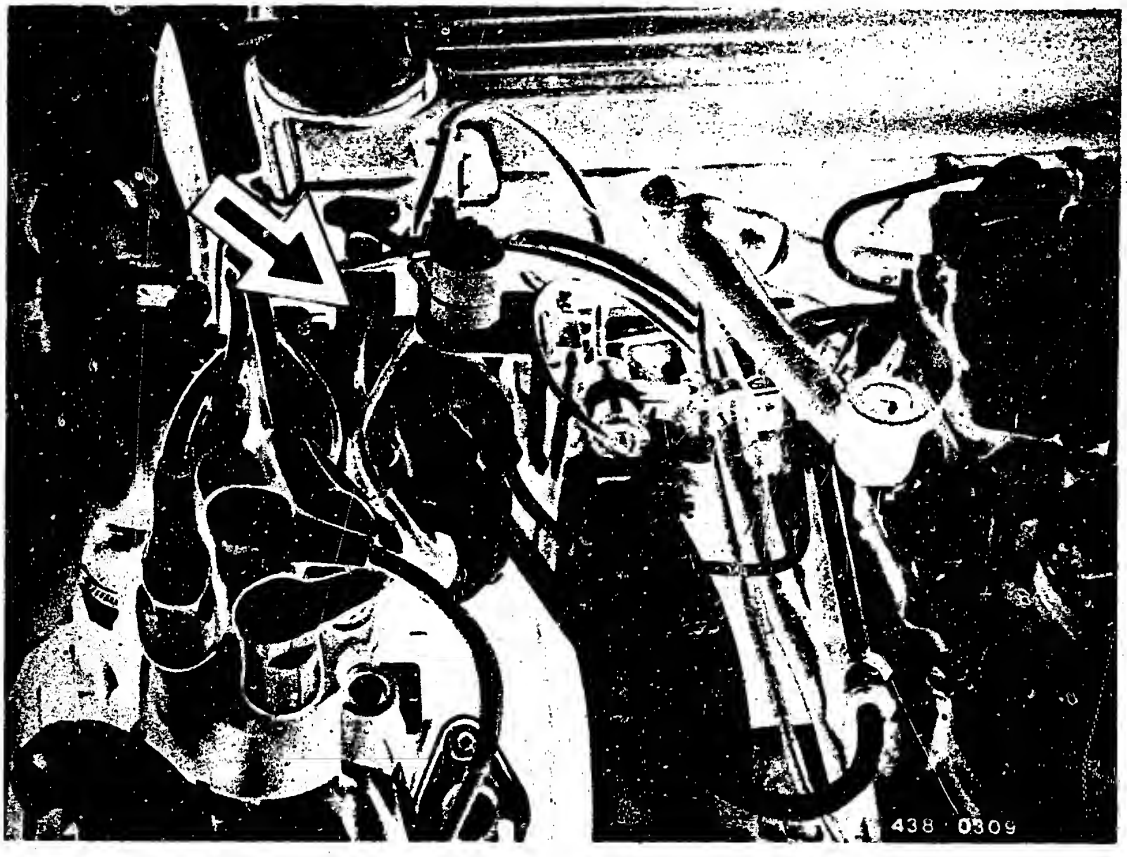
- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.
- Strainer in double fitting of fuel distributor inlet clogged.

If these points are O.K., the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.

12.6 Removal and installation of the electric fuel pump:

Pinch off the fuel intake hose from the fuel tank to the electric fuel pump (e.g. using hose clamper W 157 from Matra Co.).

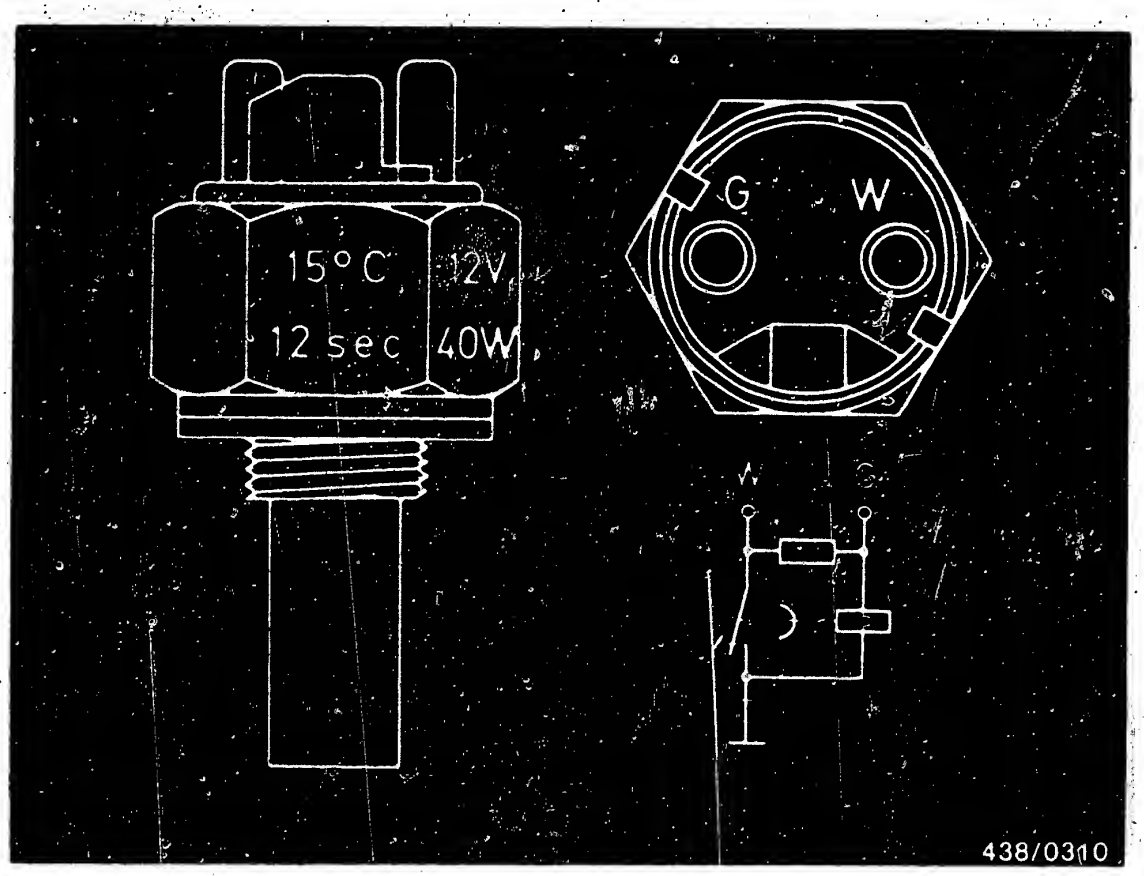
When installing, use a new seal and pay attention to the correct positioning of the electric fuel pump. Danger of bending the fuel lines.



13. Checking the cold-start system (thermo-time switch, cold-start valve).

13.1 Thermo-time switch (not a Bosch product)

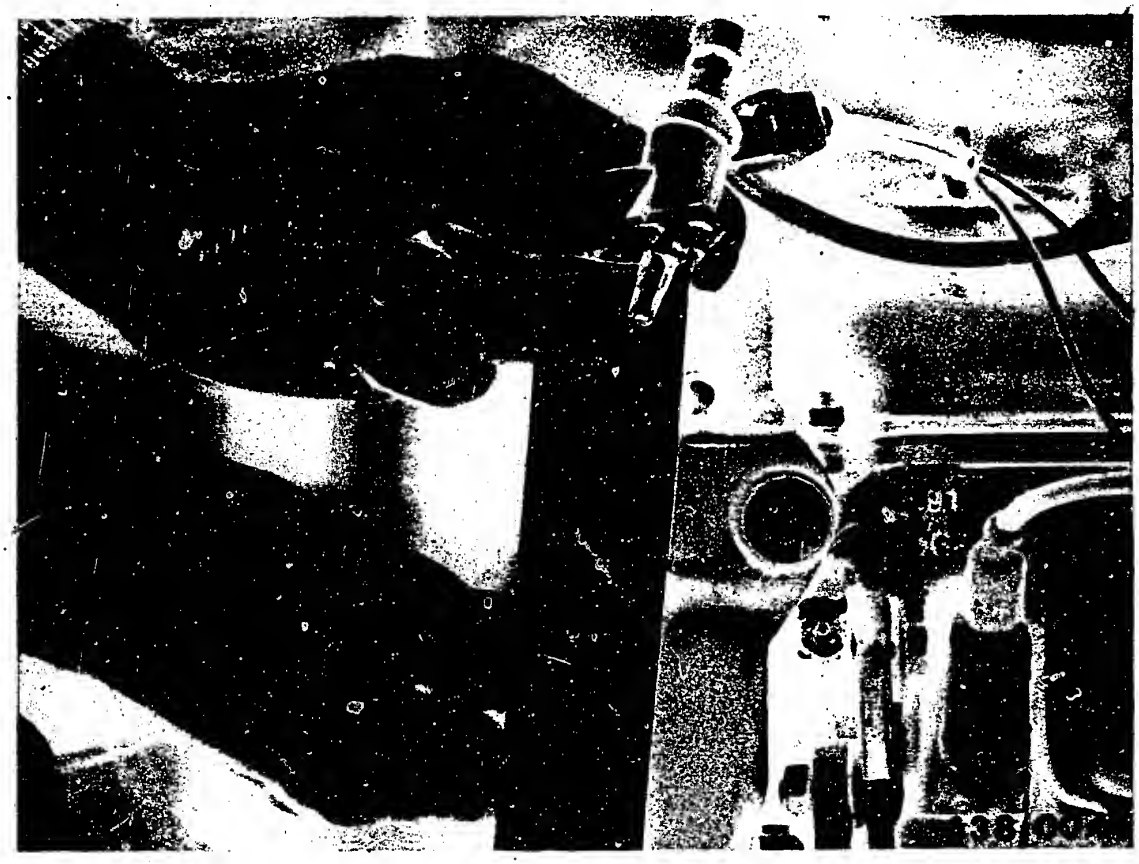
Pull off the plug.
Remove the thermo-time switch for testing.
Collect any escaping coolent in a container.



The switching temperature +15°C and the switching time at -20°C of 12 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+10		40...60Ω	0 Ω	40.. 60Ω
	+20	50...70Ω	240...300 Ω	180..240Ω



13.2 Start valve

Remove the start valve. Connect a hose line instead of the steel tubing.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B+. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinate F 3.

14. Checking the control pressures

14.1 Preliminary remarks:

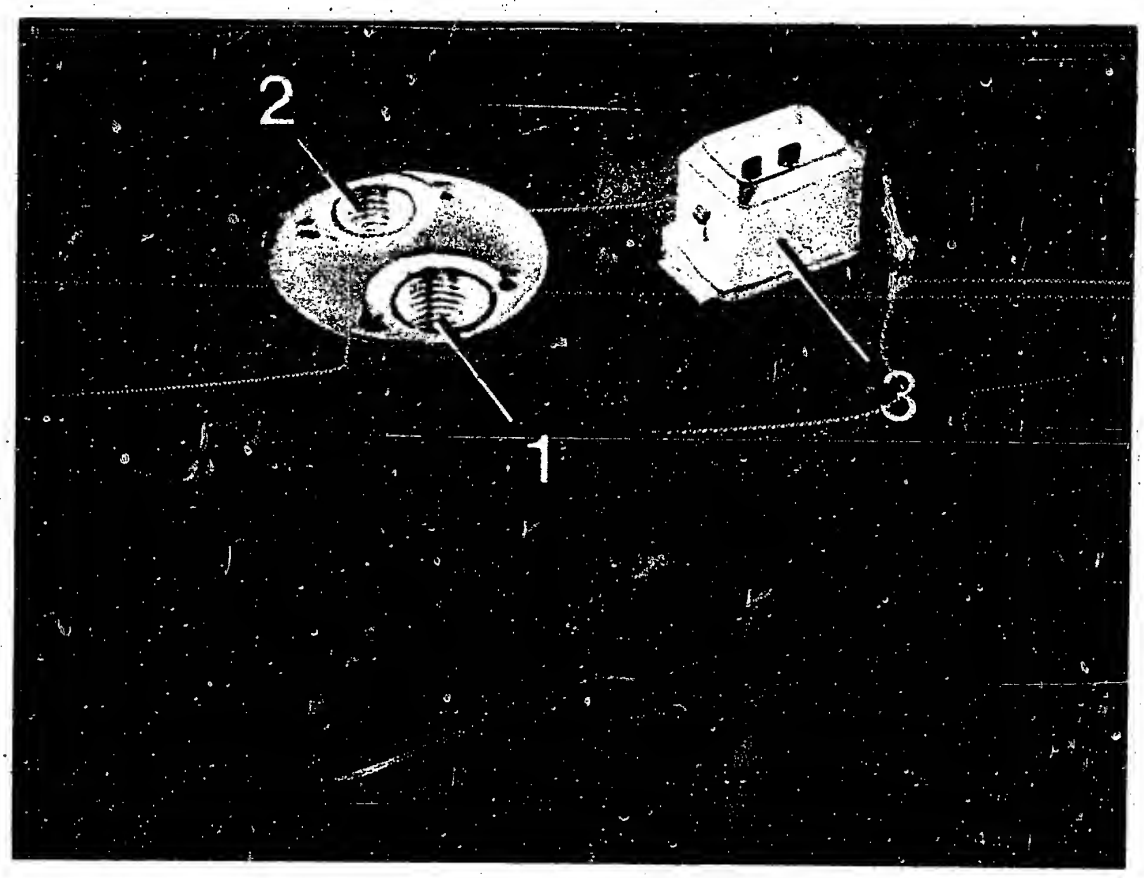
The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Test specification: 160...240 cm^3/min.

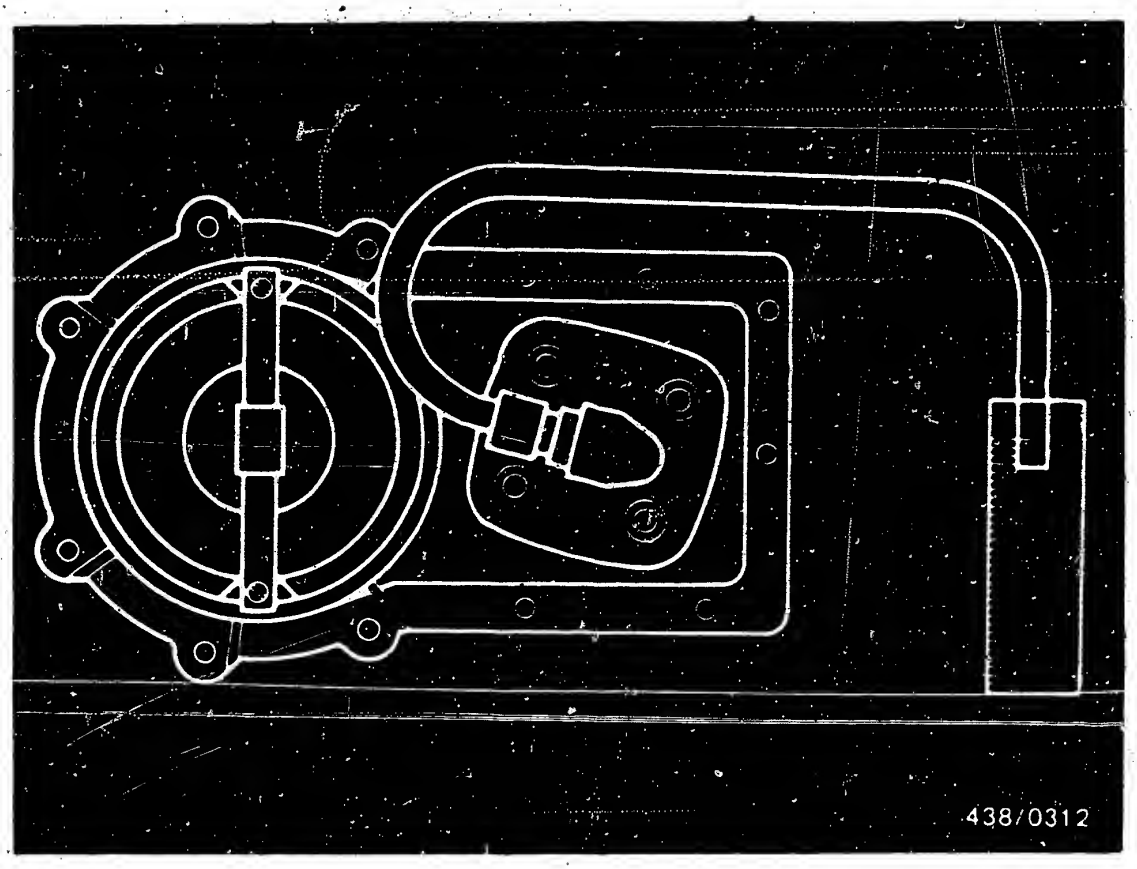
Reference is made to the other possible causes of trouble in the respective test step.



1 = Intake port (M 10 x 1)
2 = Return port (M 8 x 1)
3 = Electrical connection

14.2 Design of warm-up regulator

The warm-up regulator corresponds to the standard design, i.e. apart from control pressure "cold" and "warm" no other functions (such as full-load and altitude compensation) are performed.



14.3 Testing the fuel delivery for the control-pressure circuit:

Before testing make sure that the electric fuel pump is in proper working order.
Test specification: min. 850 cm^3/30 s

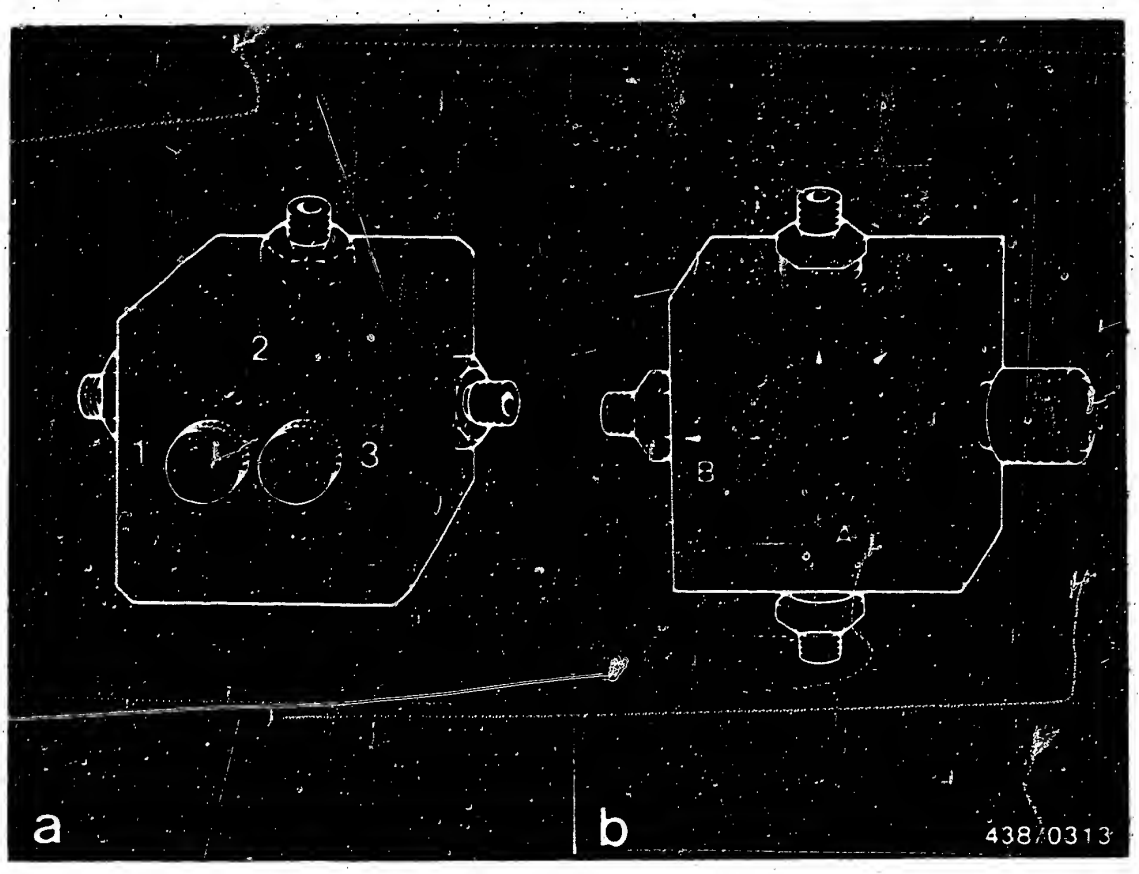
Unscrew the control-pressure line (to warm-up regulator) on the fuel distributor.

Connect connecting hose KDJE-P 100/11/1 (previously KDEP 1034/11/1) of pressure tester to control-pressure connection port of fuel distributor and hold in a graduate (approx. 0.5 l capacity).

Switch on the electric fuel pump fpr 1 minute precisely by bridging the safety circuit. Measure delivery.

Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.

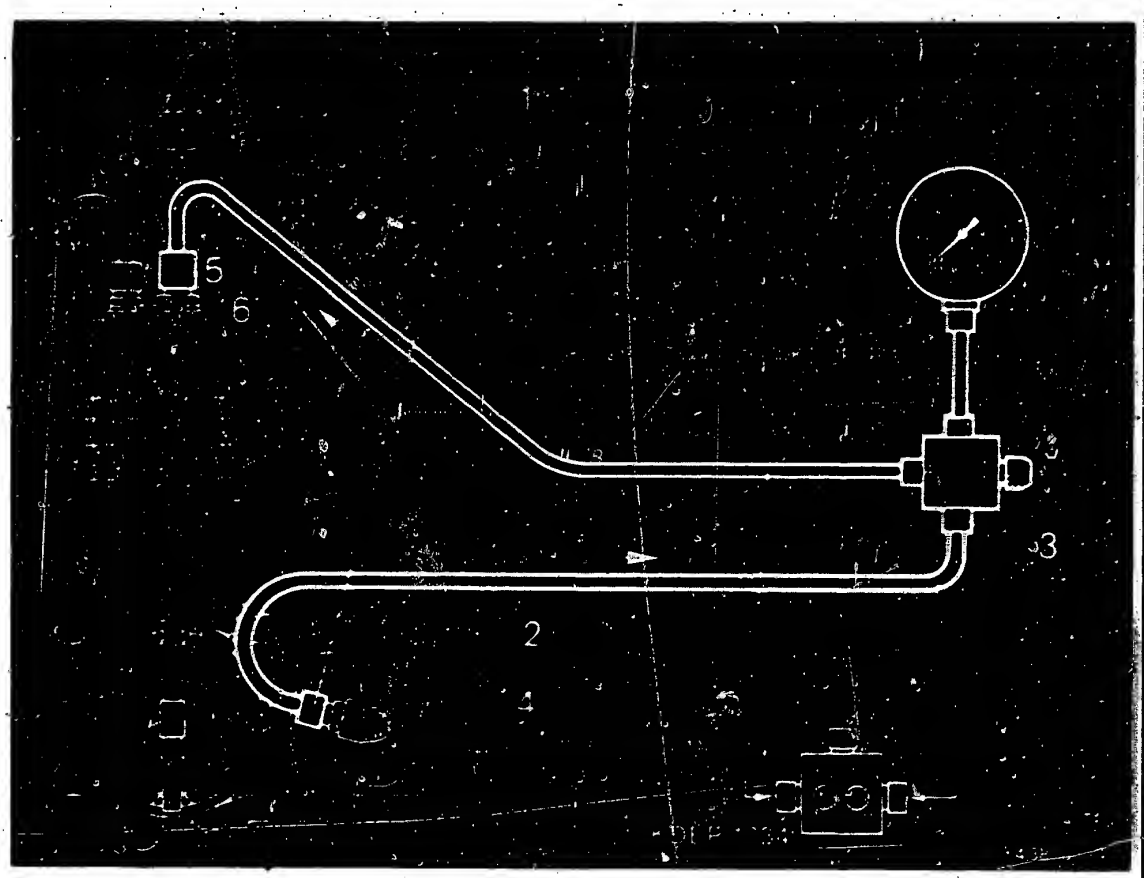


14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



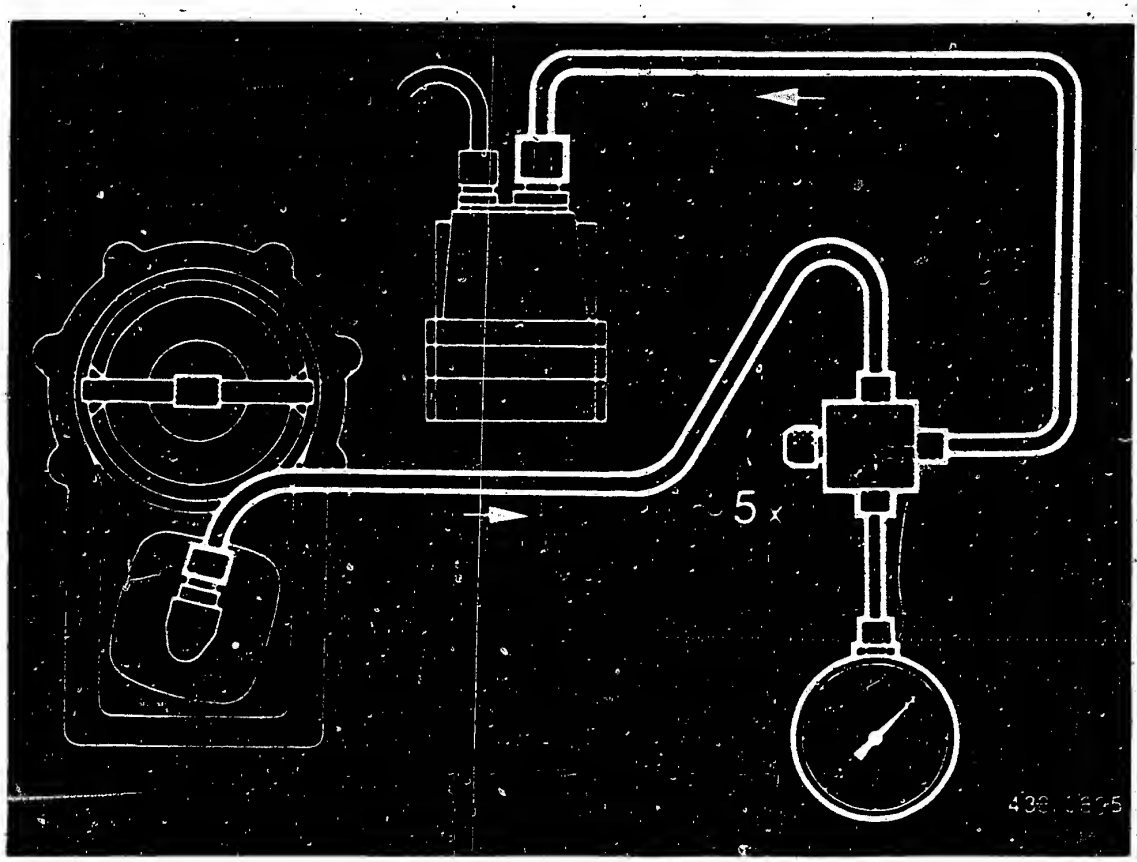
The directional control valve of the pressure tester is connected between fuel distributor and warm-up regulator.

Fit using connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).

Unscrew the steel control-pressure line (1) from fuel distributor and warm-up regulator.
Connect connecting hose KDJE-P 100/11/1 (2) to inlet fitting (3) of directional-control valve and connect to control-pressure connection port (4) of fuel distributor.

Connect hose end (5) of directional-control valve to inlet fitting (6) of warm-up regulator.

Suspend pressure gauge from engine compartment lid.



14.5 Bleeding the pressure tester

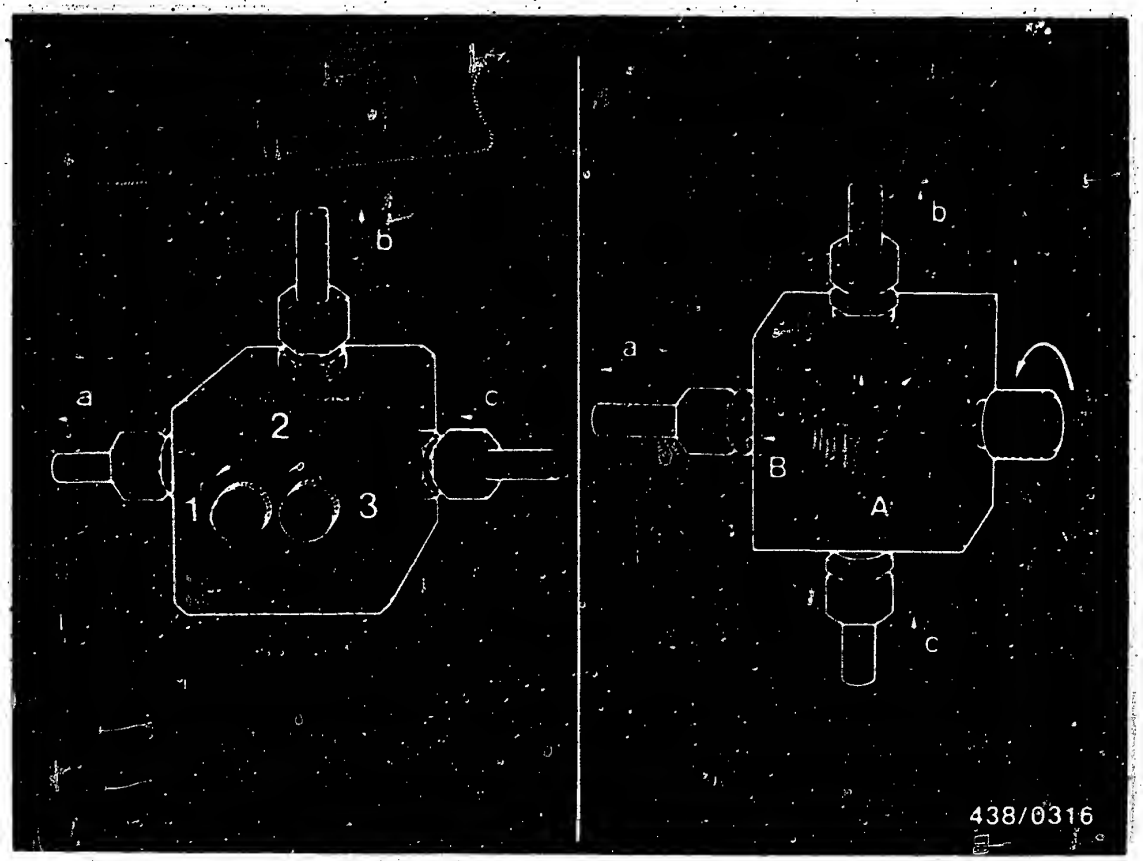
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

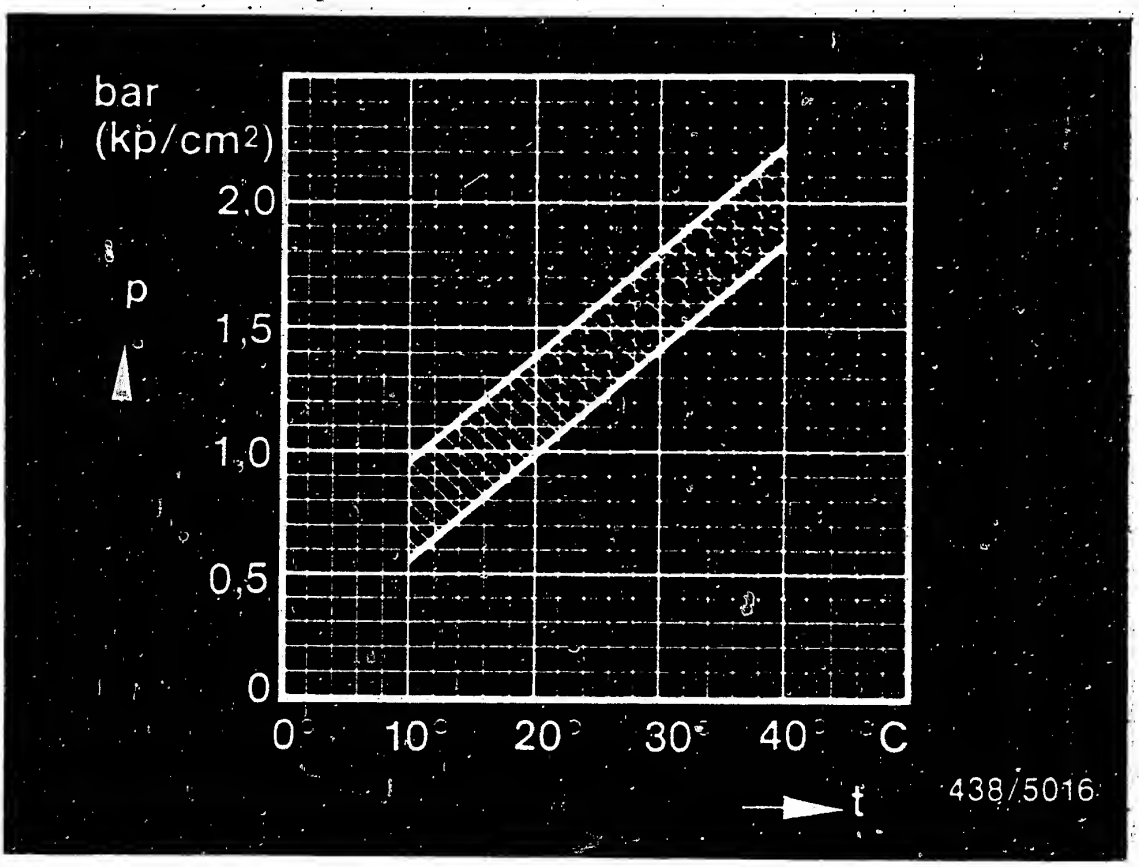
14.6 Testing the "cold" control pressure

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

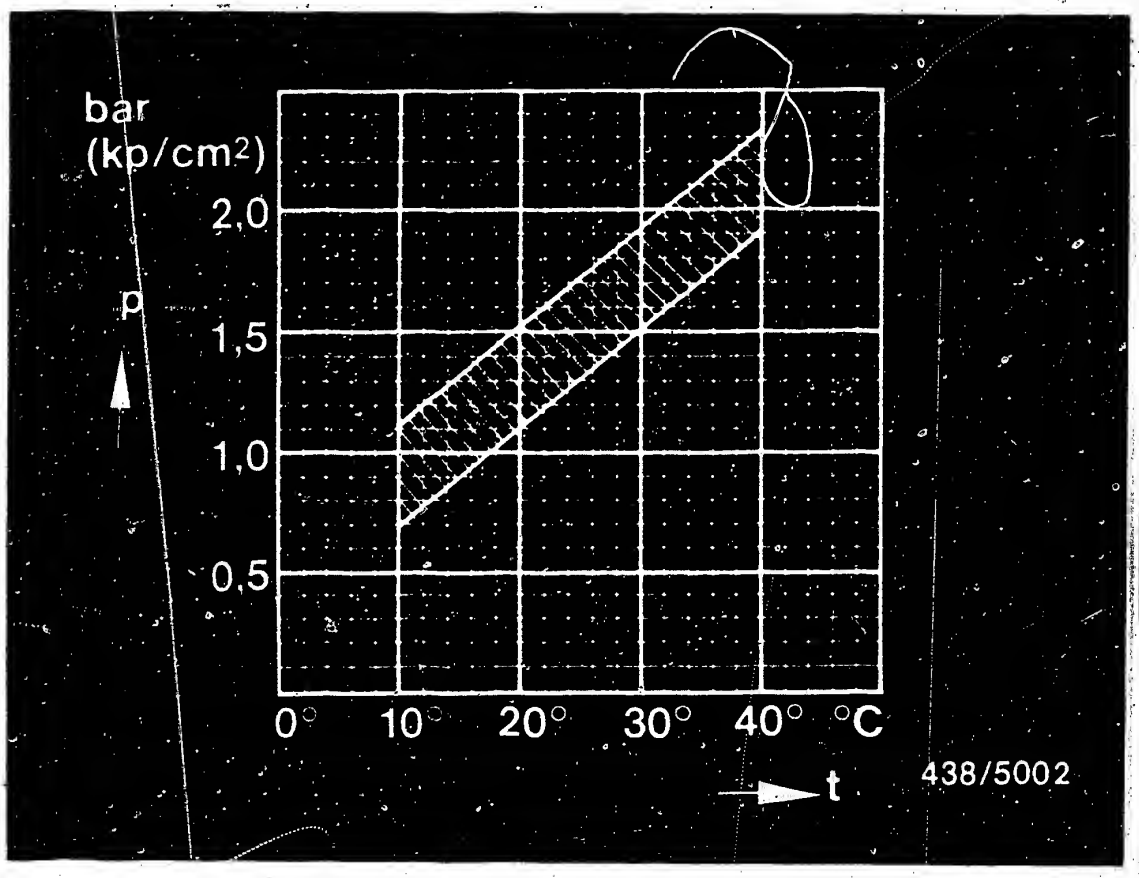
Switch on the electric fuel pump by bridging the electrical safety circuit.



p = Control pressure (bar of kgf/cm² gauge pressure)
t = Ambient temperature (°C)

- Warm-up regulator Part No.: 0 438 140 065 up to FD 052
  0 438 140 100

The pressure gauge of the pressure tester indicates the "cold" control pressure.
Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.
Example:
Ambient temperate = 20°C
Nominal control pressure = 1.0...1.4 bar gauge pressure



p = Control pressure (bar or kfg/cm² gauge pressure)
t = Ambient temperature (°C)

"Cold" control pressure

- Warm-up regulator Part No.:
  0 438 140 065 as from FD 141

If the measured "cold" control pressure differs from the set value, this may be due to one of the following faults:

If "cold" control pressure too high:

- Fuel delivery for control-pressure circuit too high. Test fuel delivery.

  Test specification: 160...240 cm^3/min.

  If measured fuel delivery is greater, replace the fuel distributor.

- Damping control-pressure line or strainer in inlet of warm-up regulator clogged. Replace defective part.

- Fuel return from warm-up regulator blocked or constricted.
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, provide the new warm-up regulator with tube fitting 1 433 356 802. Tightening torque 20...22 Nm (2.0... 2.2 kgfm).

If "cold" control pressure too low:

- Fuel delivery for control-pressure circuit too low. Test fuel delivery.

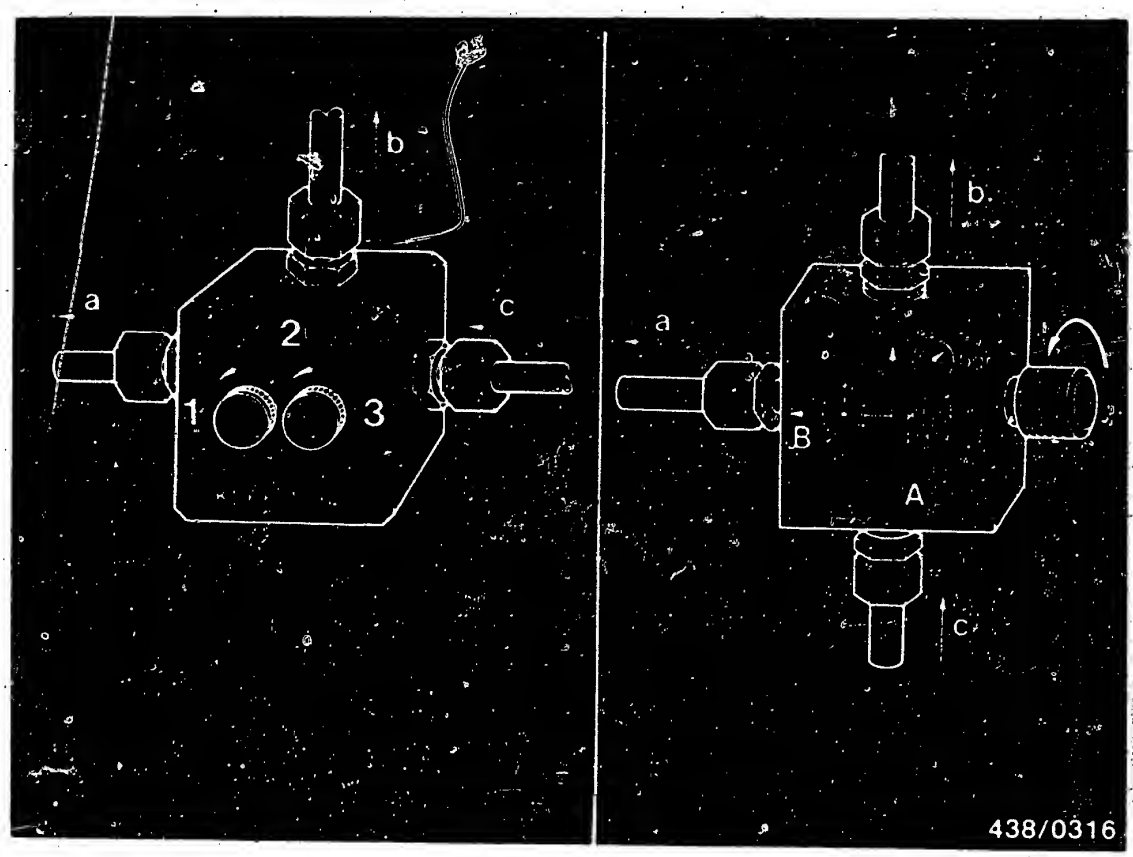
  Test specification: 160...240 cm^3/min.

  If the measured fuel delivery is smaller, replace the fuel distributor.

- Warm-up regulator defective. Replace warm-up regulator.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate F 3.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

The test is carried out with the engine switched off.
The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Attach the plug to the warm-up regulator.
Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.
Test specification for "warm" control pressure:
3.4...3.8 bar gauge pressure (3.5...3.9 kgf/cm² gauge pressure)

If the measured "warm" control pressure differs from the set value, this may be due to one of the following faults:

If "warm" control pressure too high:

- Fuel delivery for control-pressure circuit too high. Test fuel delivery.

  Test specification: 160...240 cm^3/min.

  If the measured fuel delivery is greater, replace the fuel distributor.

- Damping control-pressure line or strainer in inlet of warm-up regulator clogged. Replace defective part.

- Fuel return from warm-up regulator blocked or constricted.
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, provide the new warm-up regulator with tube fitting 1 433 356 802. Tightening torque 20...22 Nm (2.0... 2.2 kgfm).

If "warm" control pressure too low:

- Fuel delivery for control-pressure circuit too low.
  Test fuel delivery.

  Test specification: 160...240 cm^3/min.

  If the measured fuel delivery is smaller, replace the fuel distributor.

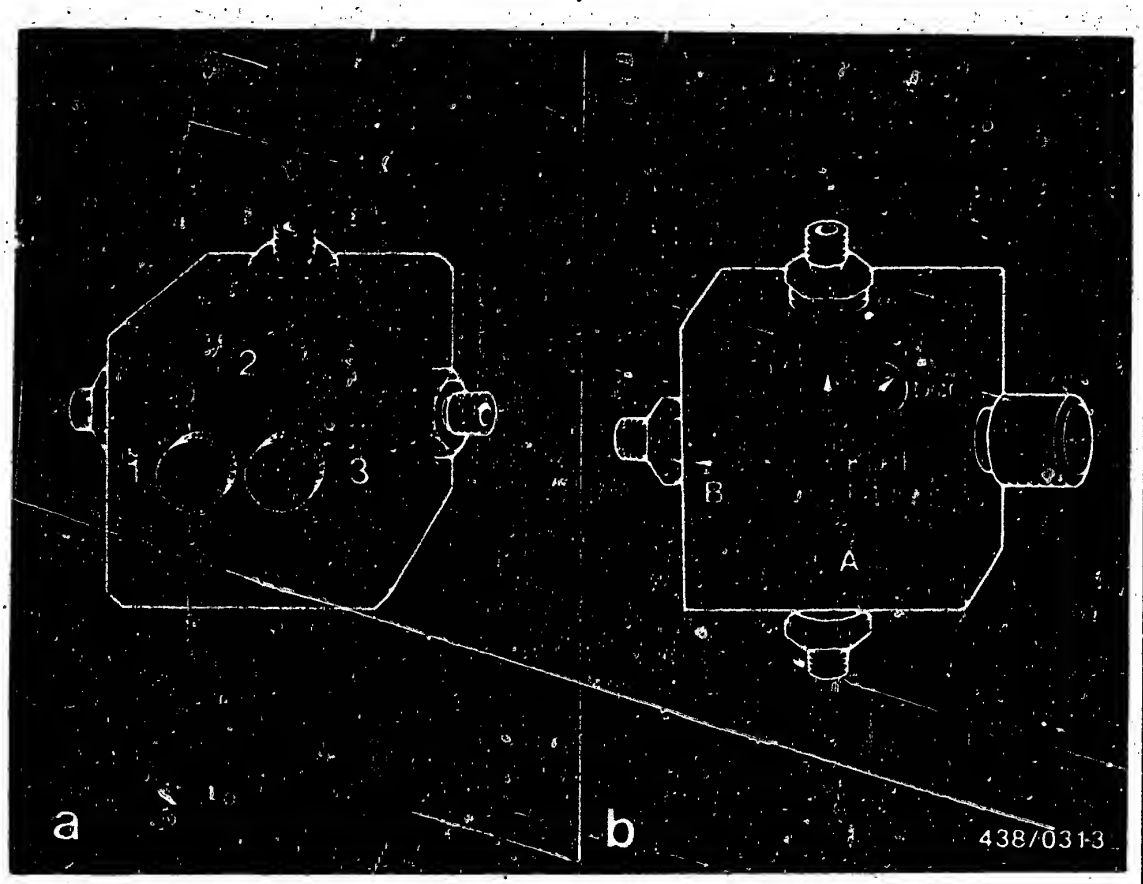
- Power supply open circuit.
  Eliminate open circuit. Make sure that proper contact is made at the plug.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the alternator voltage of approx. 14 V which is normal during driving.

- Warm-up regulator defective. Heating coil open circuit.
  Hydraulically defective. Replace warm-up regulator.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

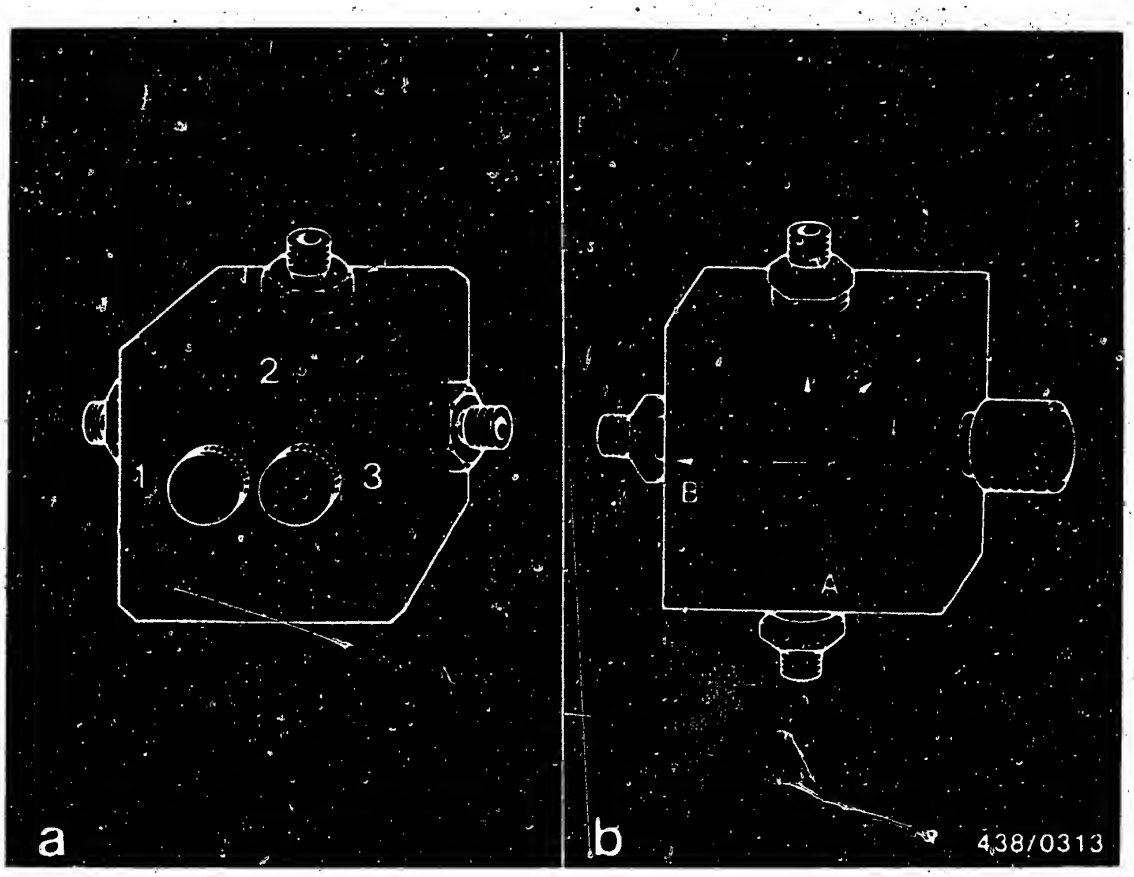
Idle adjustment is described on Coordinate F 3.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

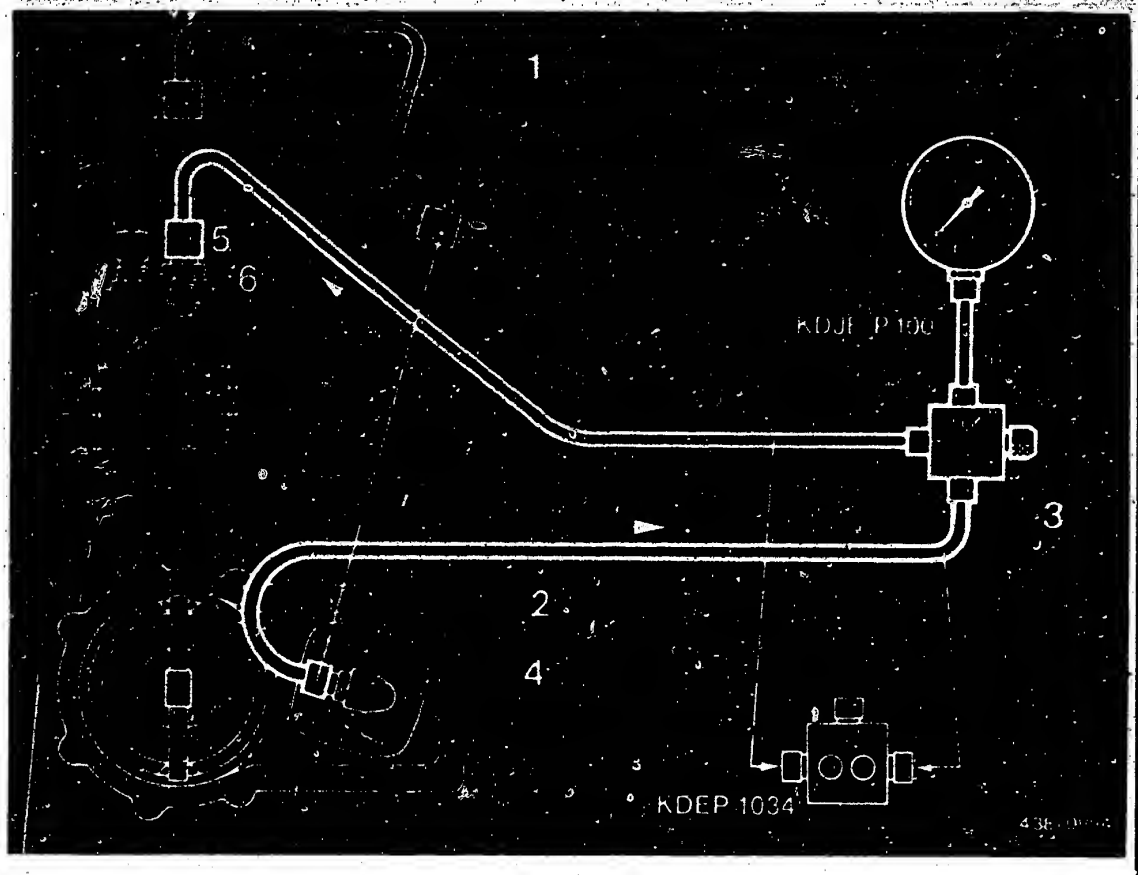
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



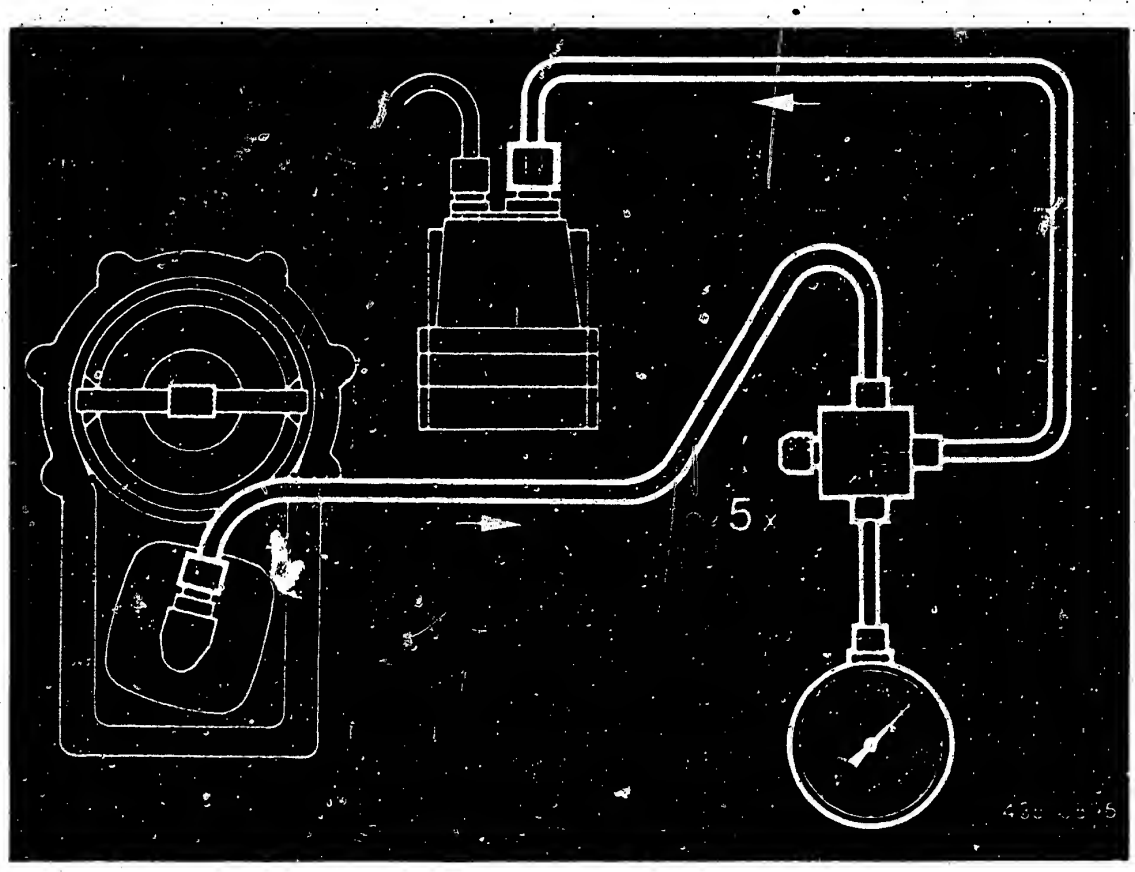
The directional control valve of the pressure tester is connected between fuel distributor and warm-up regulator.

Fit using connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).

Unscrew the steel control-pressure line (1) from fuel distributor and warm-up regulator.
Connect connecting hose KDJE-P 100/11/1 (2) to inlet fitting (3) of directional-control valve and connect to control-pressure connection port (4) of fuel distributor.

Connect hose end (5) of directional-control valve to inlet fitting (6) of warm-up regulator.

Suspend pressure gauge from engine compartment lid.



15.2 Bleeding the pressure tester

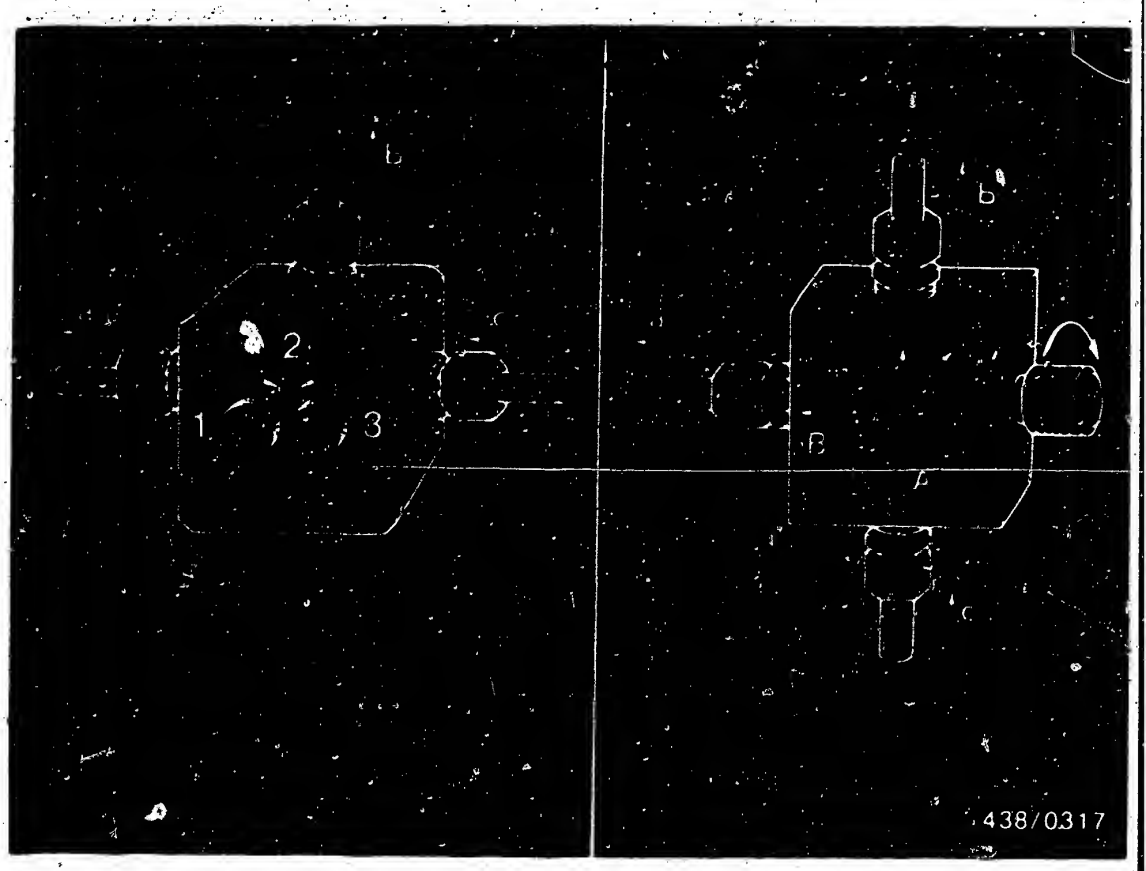
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important. Close the valve screw of directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

Primary pressure is now indicated on the pressure gauge.

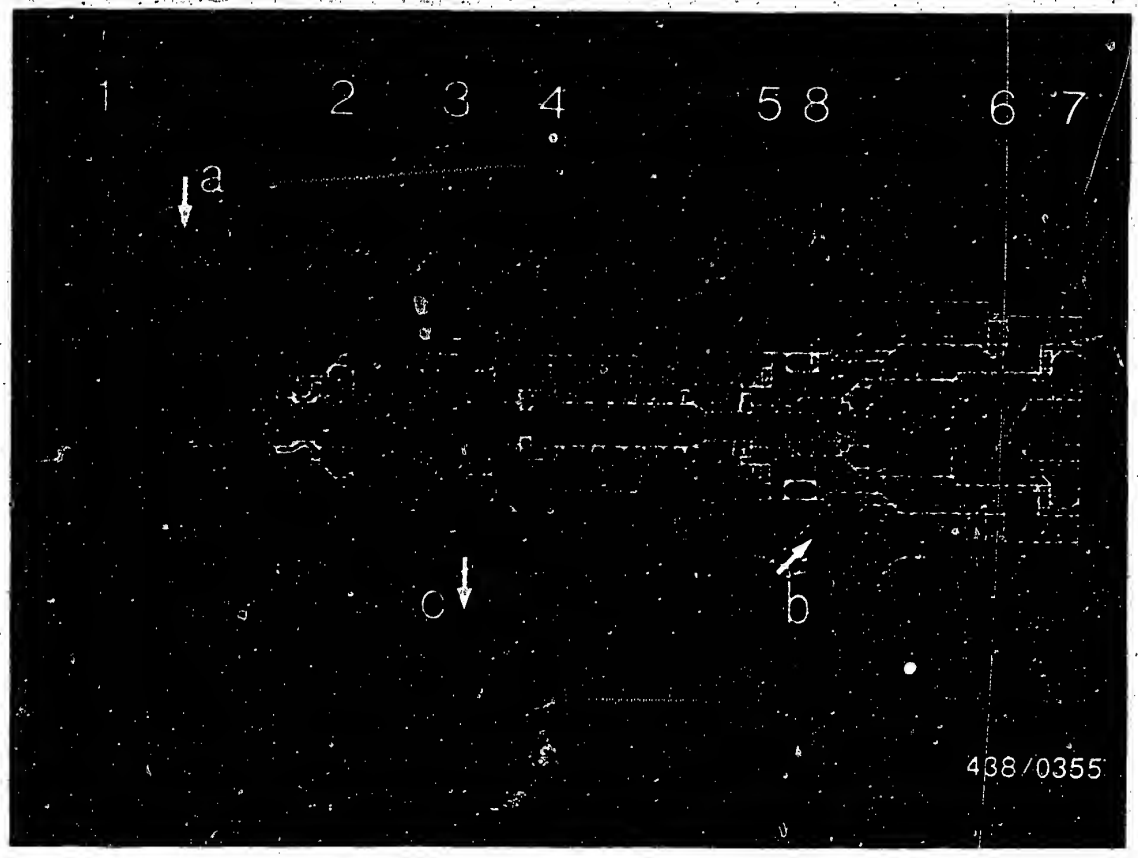
Fuel distributor part number	Primary pressure test specification (gauge pressure)
0 438 100 071 0 438 100 091	4.7...5.4 bar (4.8...5.5 kgf/cm²)

Possible causes of primary pressure being too low:

- Fuel supply not O.K.
  (Delivery of electric fuel pump too low).
- Strainer in inlet double fitting of fuel distributor clogged.
- Primary pressure incorrectly set.
  Resetting the primary pressure presupposes that the fuel supply is O.K., i.e. fuel delivery measurement: min. 850 cm³/30 seconds.

Possible causes of primary pressure being too high:

- Constriction in return line to fuel tank.
- Primary pressure incorrectly set
  Before resetting a high primary pressure, always first of all check the condition of the return line to the fuel tank.

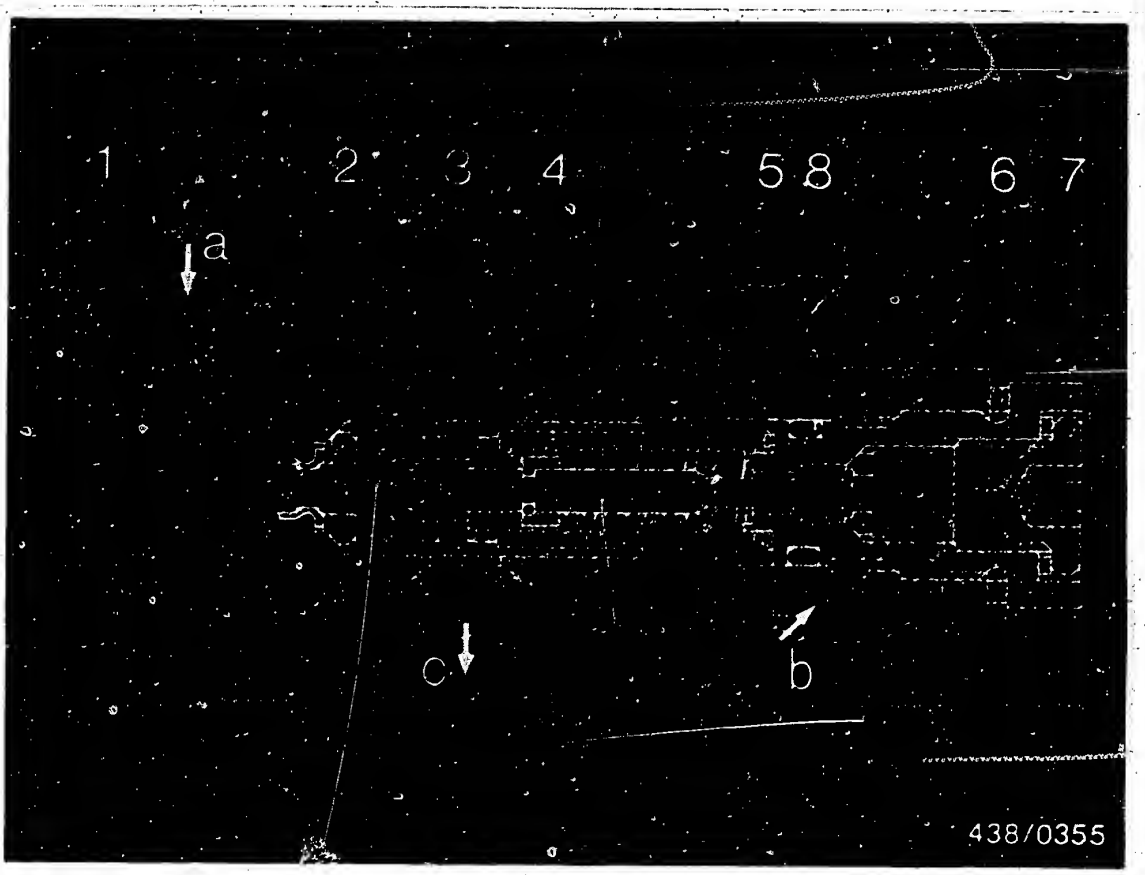


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped ring (formerly O-ring)
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

15.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 071 0 438 100 091	4.9...5.1 bar (5.0...5.2 kgf/cm²) gauge pressure

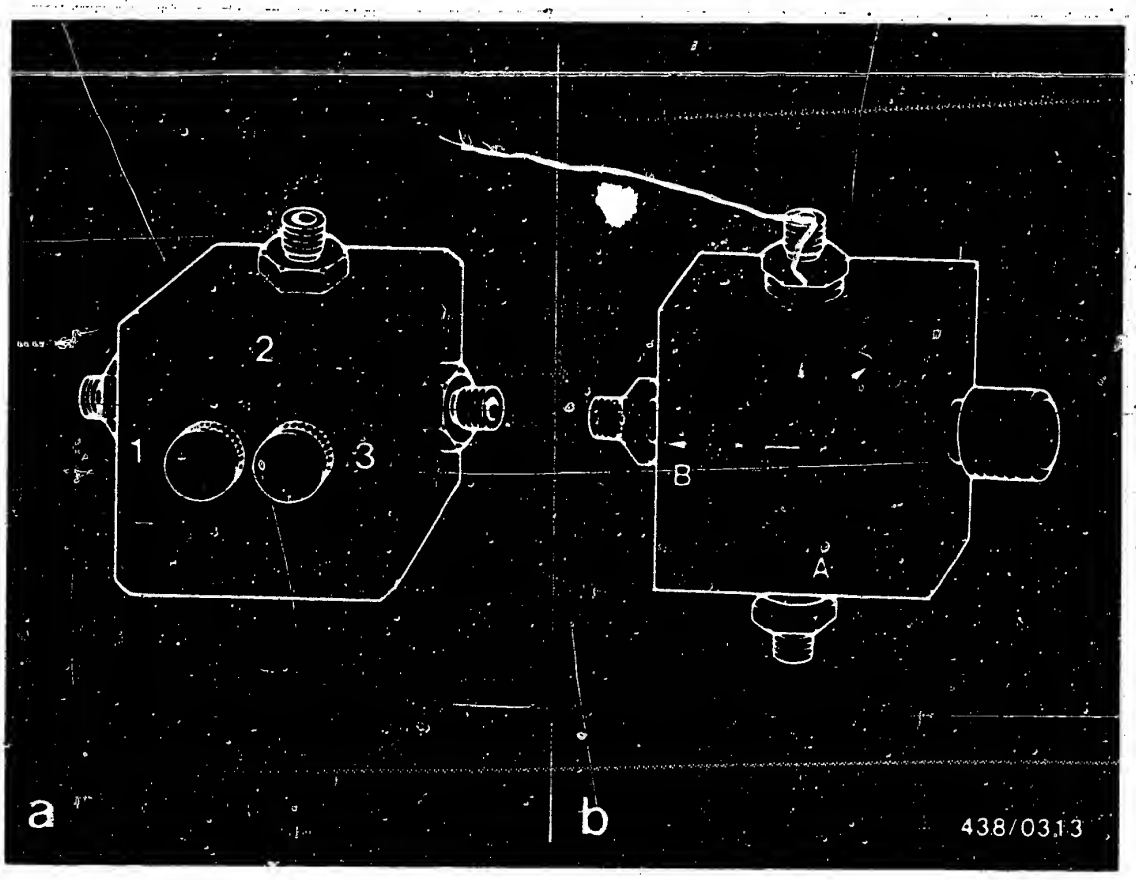


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 7) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 6) and O-ring (Item 8).

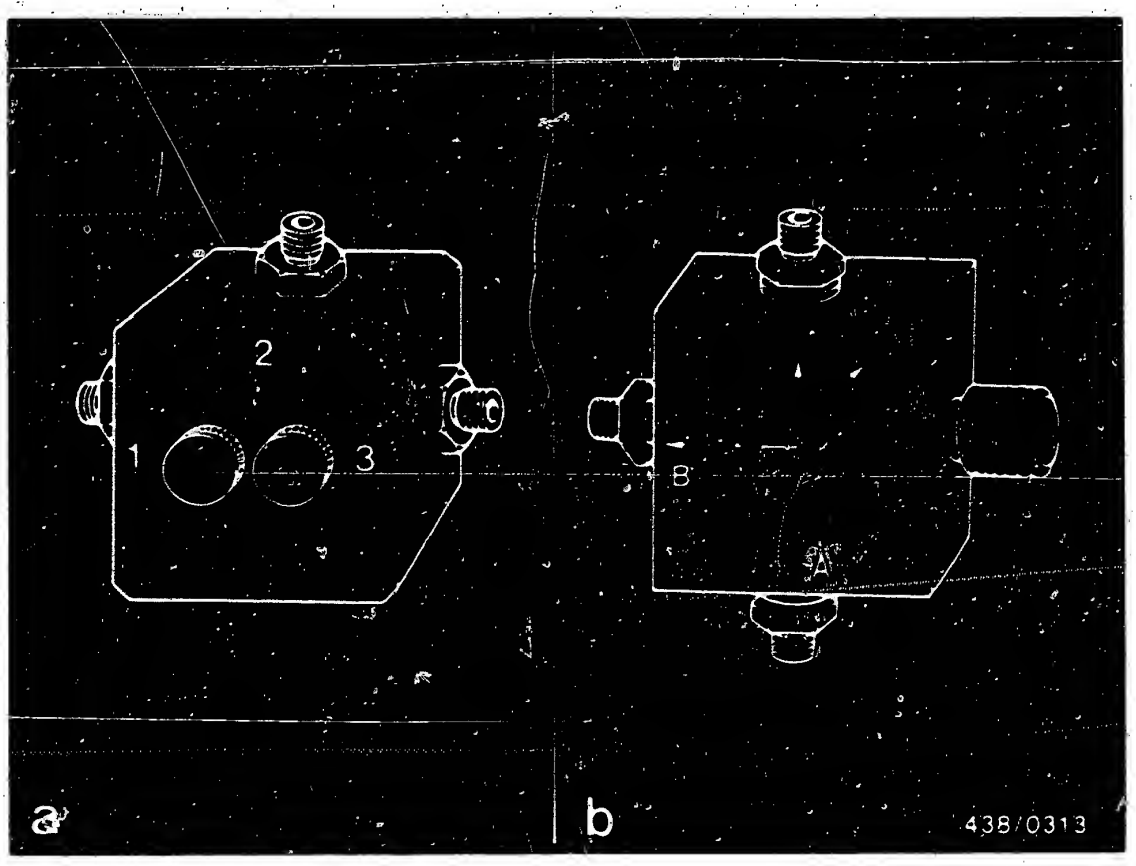
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

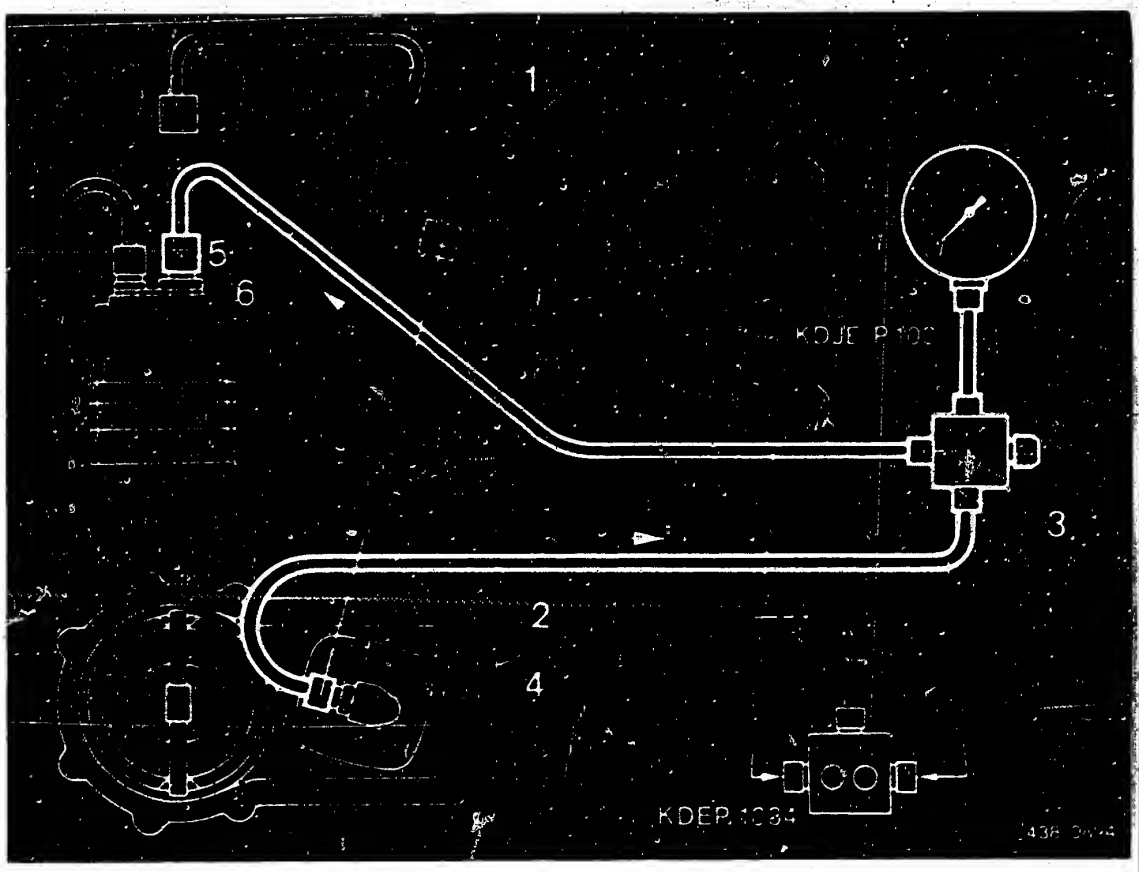
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



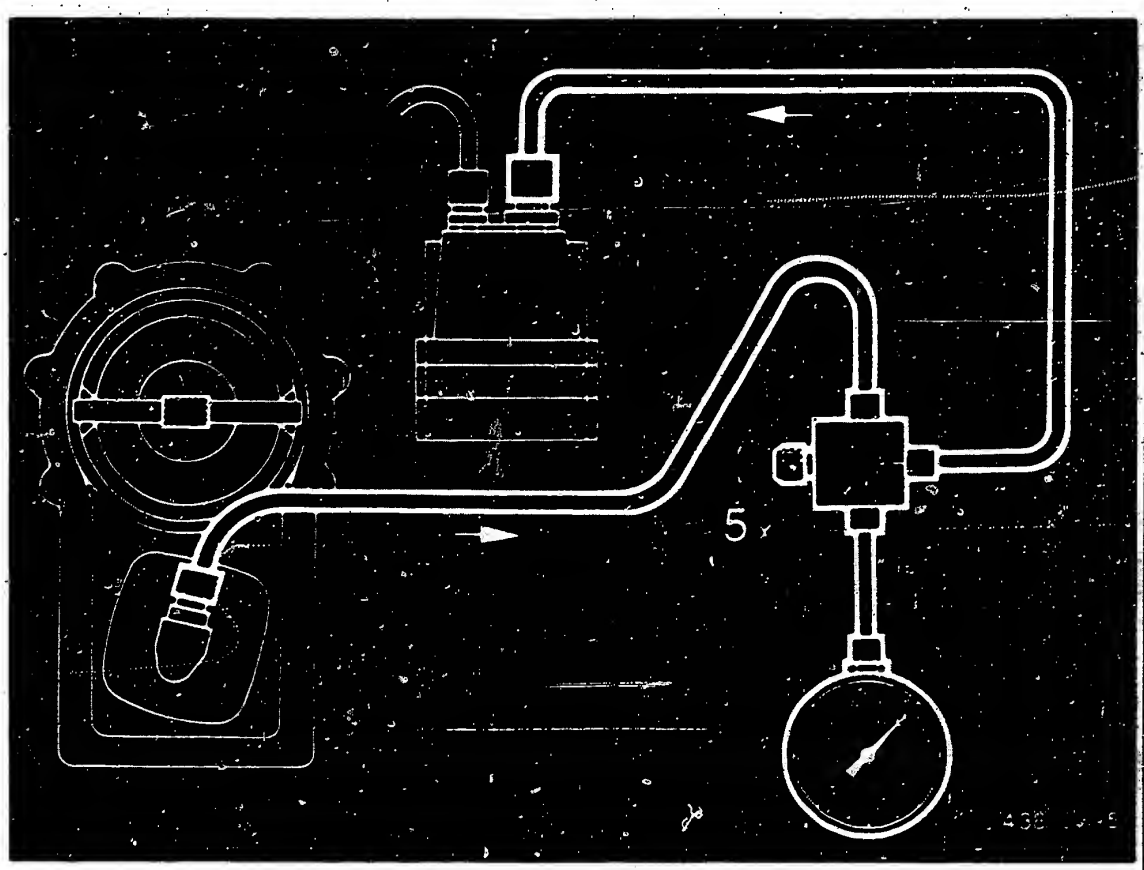
The directional control valve of the pressure tester is connected between fuel distributor and warm-up regulator.

Fit using connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).

Unscrew the steel control-pressure line (1) from fuel distributor and warm-up regulator.
Connect connecting hose KDJE-P 100/11/1 (2) to inlet fitting (3) of directional-control valve and connect to control-pressure connection port (4) of fuel distributor.

Connect hose end (5) of directional-control valve to inlet fitting (6) of warm-up regulator.

Suspend pressure gauge from engine compartment lid.



16.2 Bleeding the pressure tester

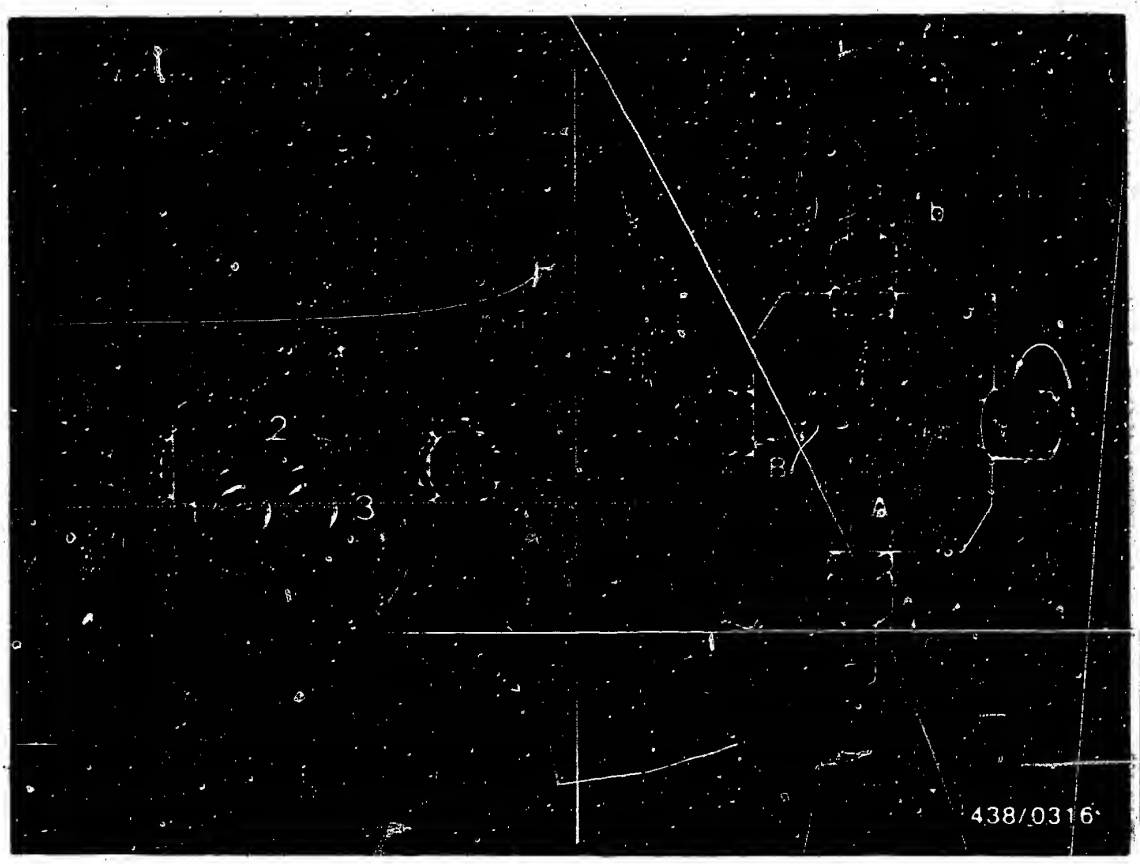
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

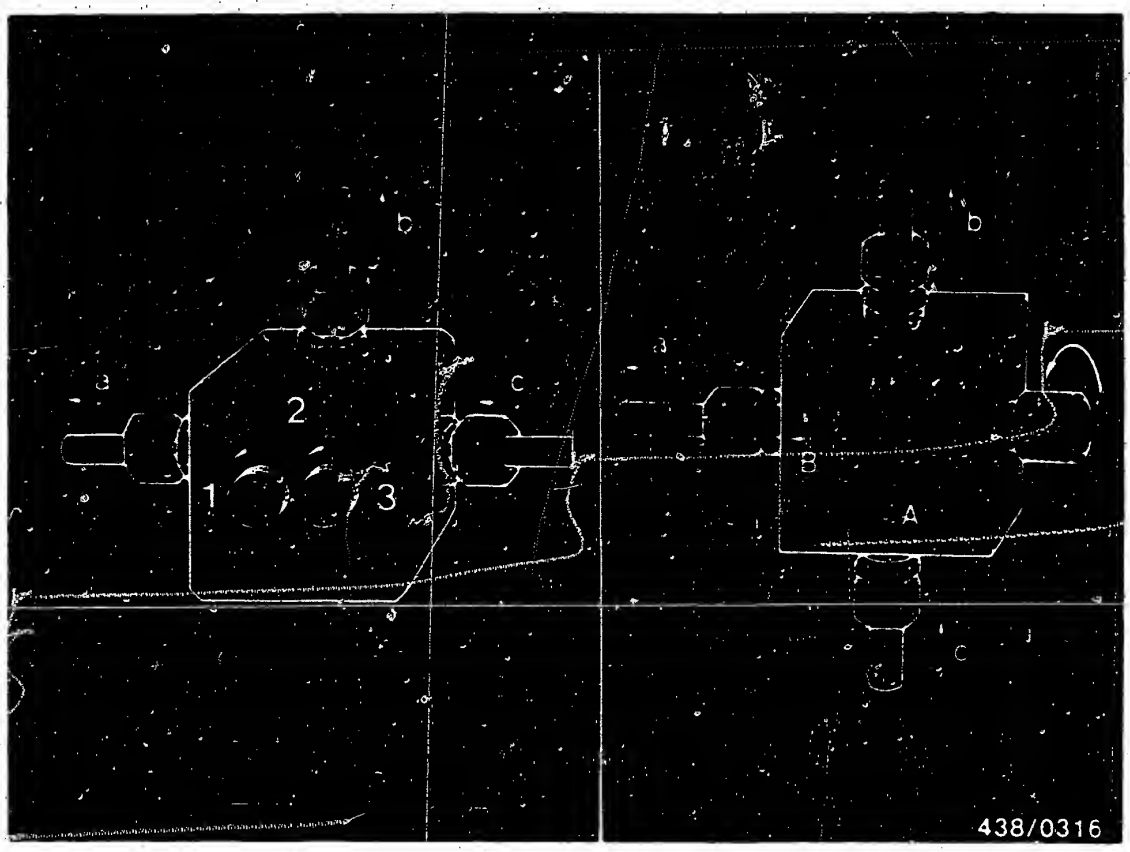


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off.

Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

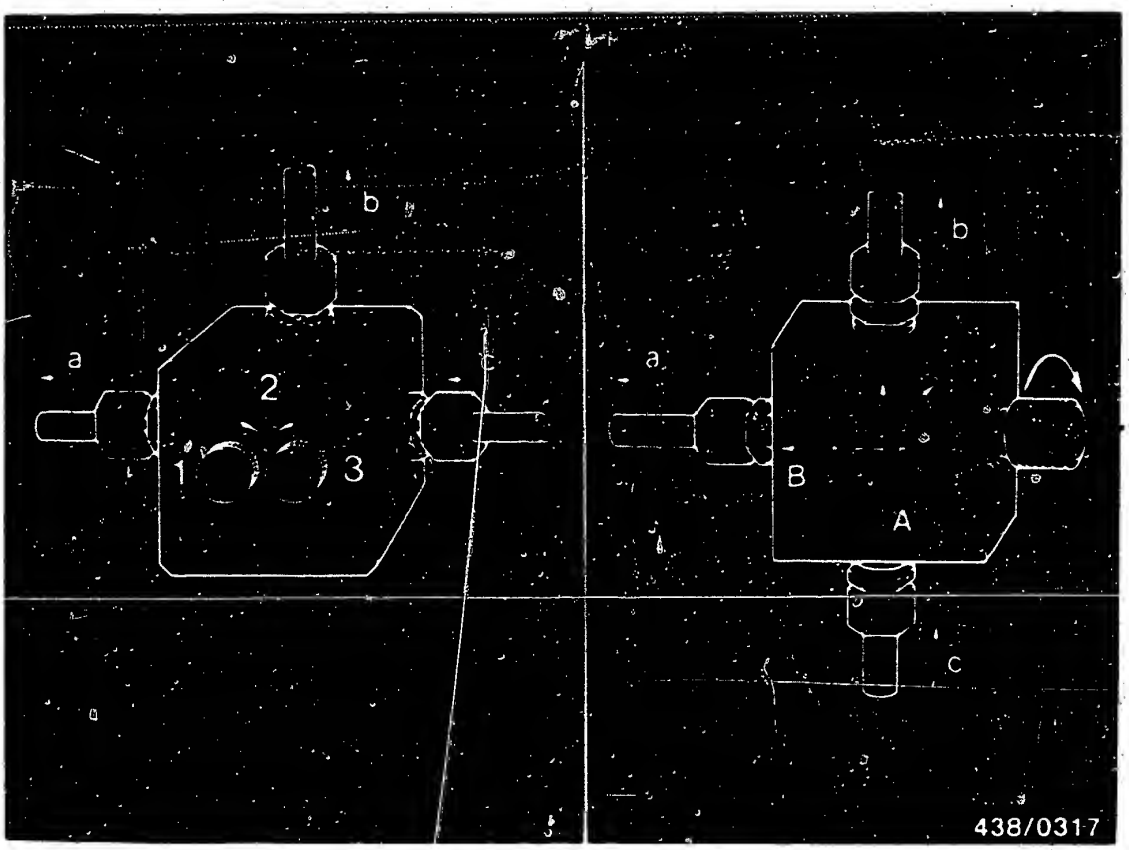


Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

Minimum pressure after:
10 minutes: 2.7 bar (2.8 kgf/cm²) gauge pressure
20 minutes: 2.6 bar (2.7 kgf/cm²) gauge pressure



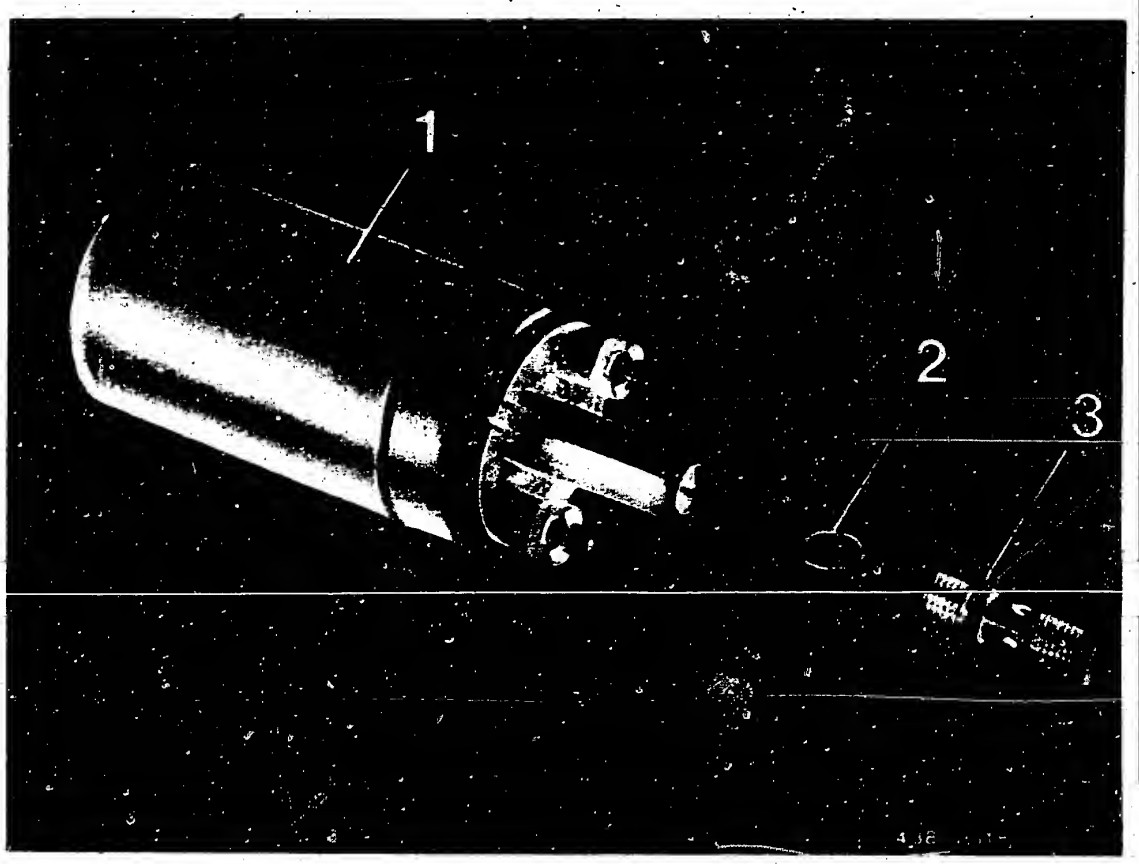
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.

If the test results are correct during the second test, the leak is in the control-pressure circuit.



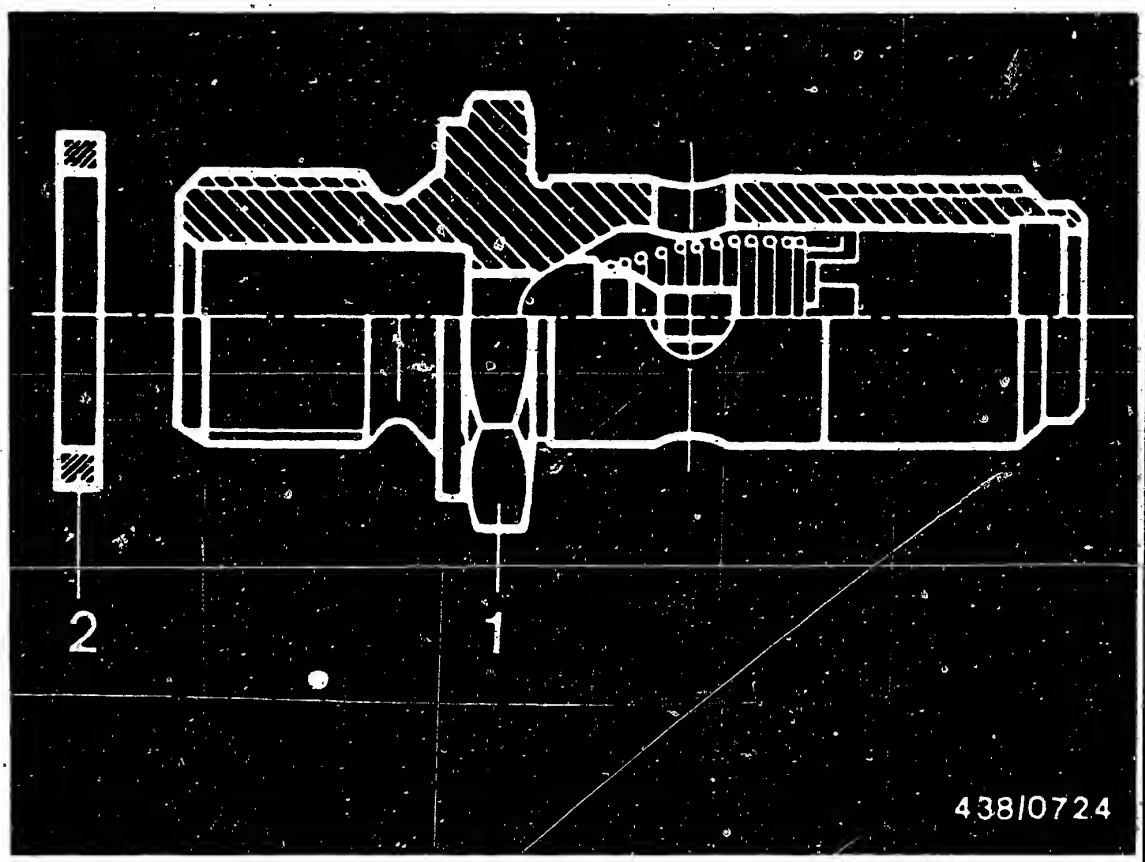
1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

16.4 Possible causes of a defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

Part No. of electric fuel pump: 0 580 254 973
0 580 254 974

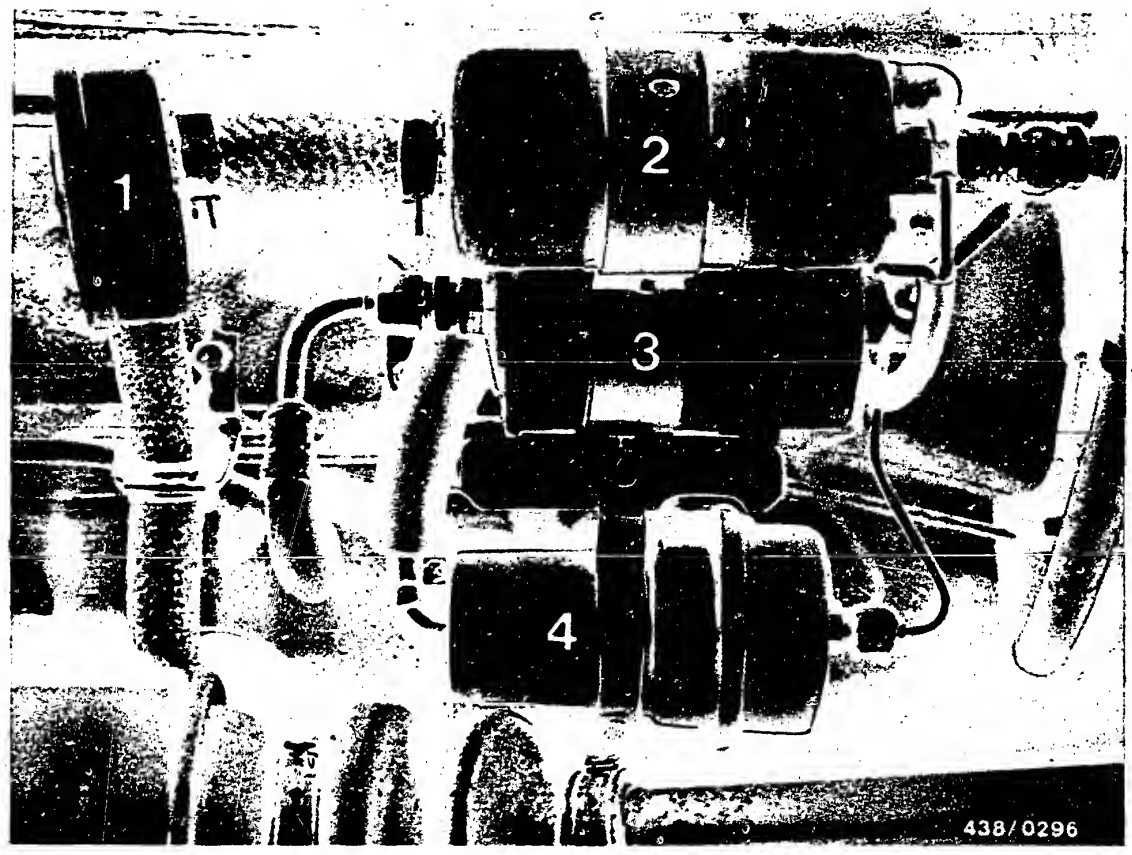
The non-return valve is built into the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 002

If necessary, replace the tube fitting from the parts set 1 587 010 002 as follows:



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

Installing the parts set:

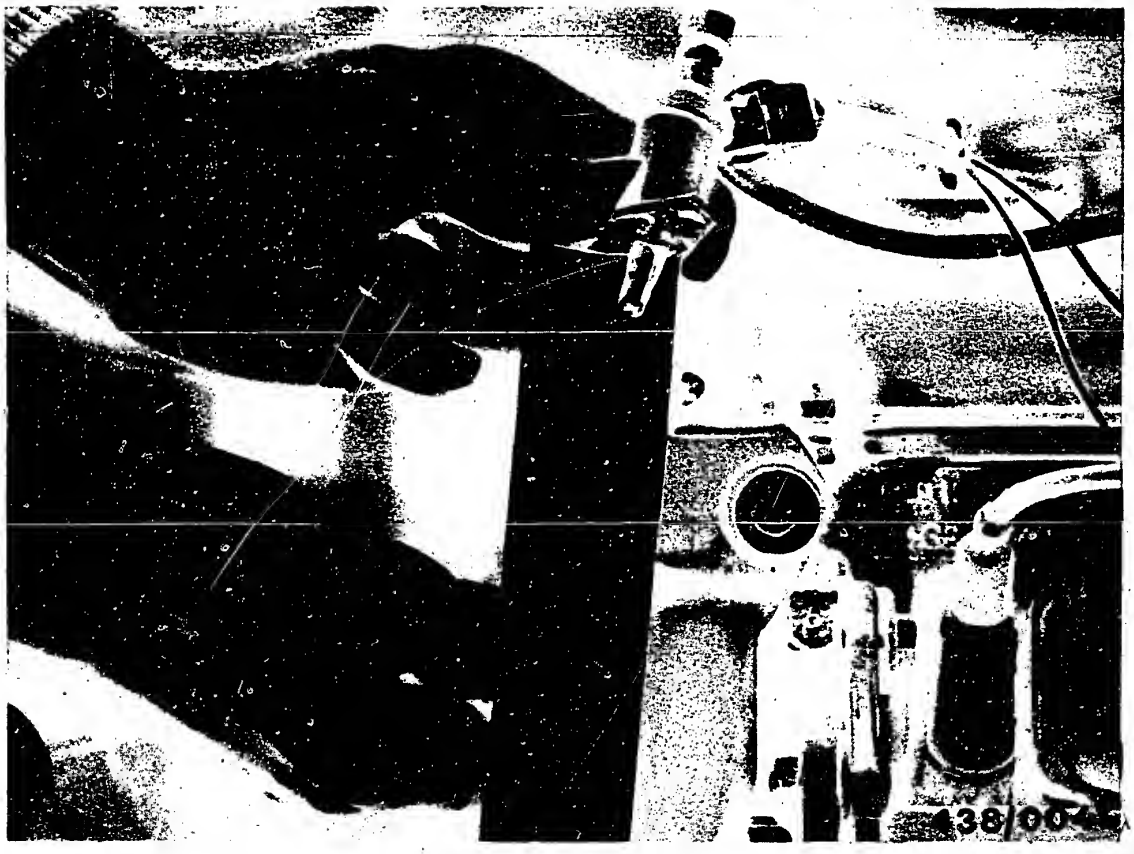
Remove the dirt-deflector plate and thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (between fuel tank and intake-noise damper), for example, using hose clamper W 157 from the Matra Co.

Screw off the delivery line, collecting any escaping fuel.

Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line union and another flat seal ring into the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

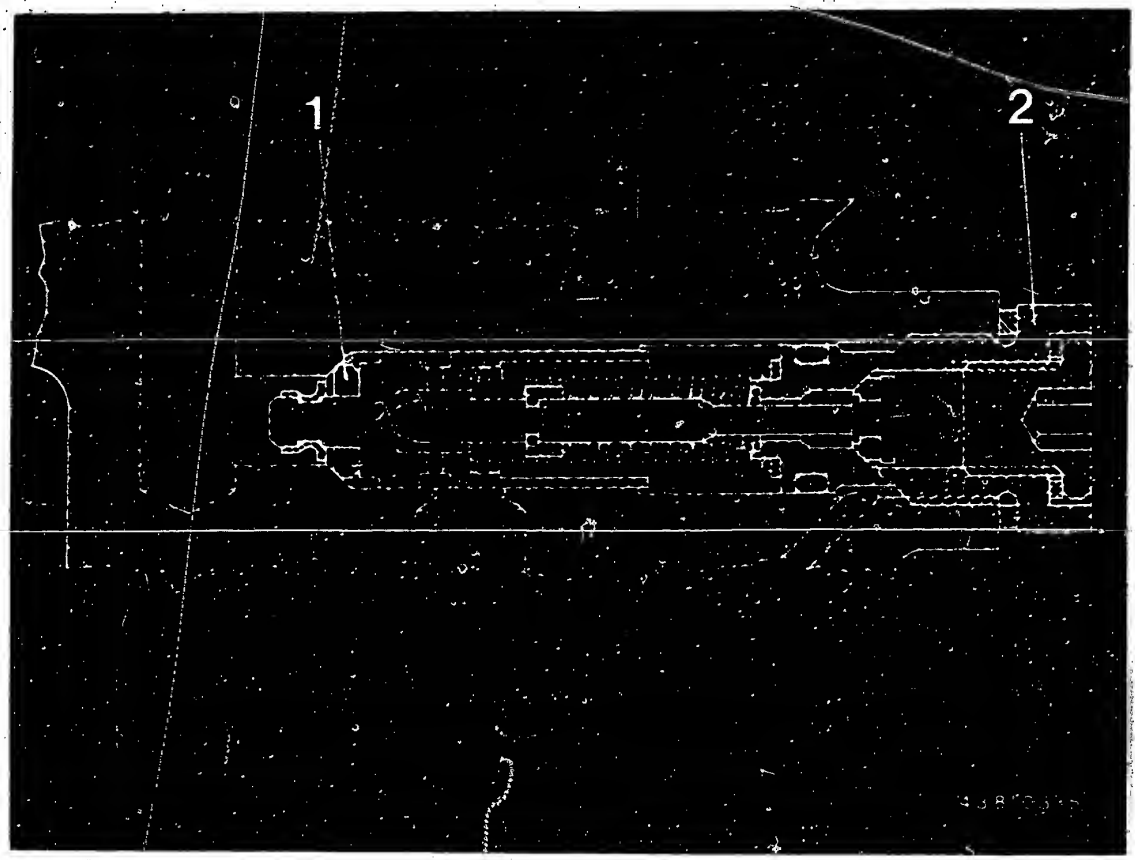
Check connections for leaks with the electric fuel pump in operation.



- The cold-start valve has a leak.

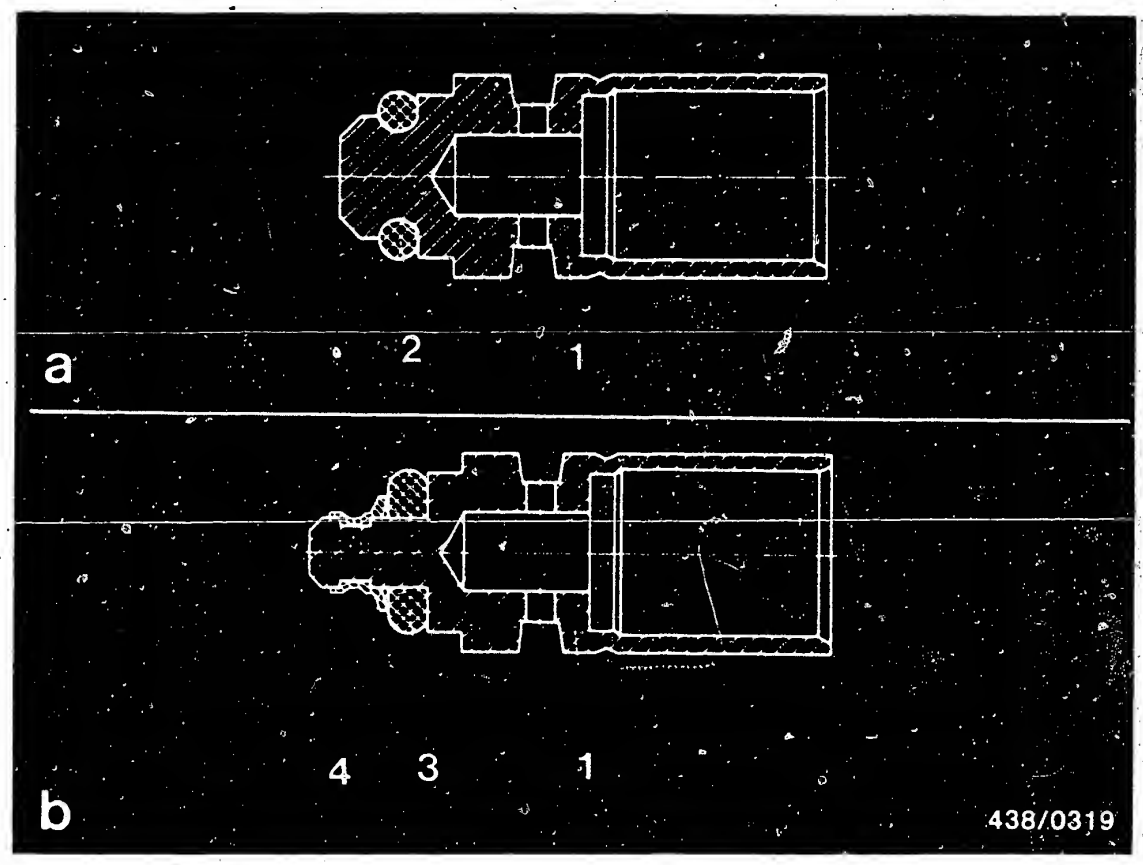
Remove cold-start valve and connect hose line (e.g. KDJE-P 100/11/1) in place of the steel tubing.

Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky, and then carry out the idle adjustment with the engine at normal operating temperature. See Coordinates F 3.



- Seal ring (1) on control piston of primary pressure regulator has a leak.

Replace seal ring:
Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug (2) with the complete push-up valve. Also remove shims, control spring and control piston.

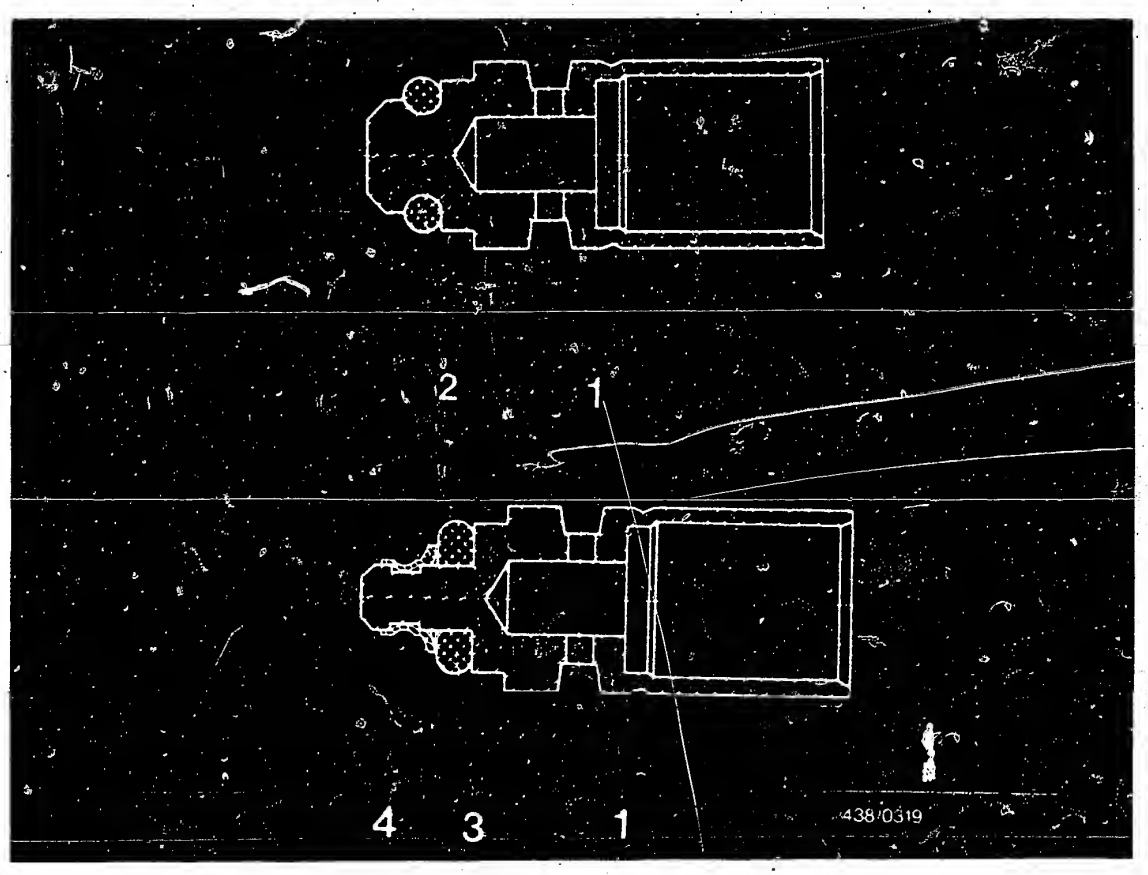


Control piston version with O-ring (Fig. a):

Change O-ring (Item 2).
Fit control piston (Item 1) and control spring.
Screw in screw plug with complete push valve and with shims (as when removed) and new seal rings.

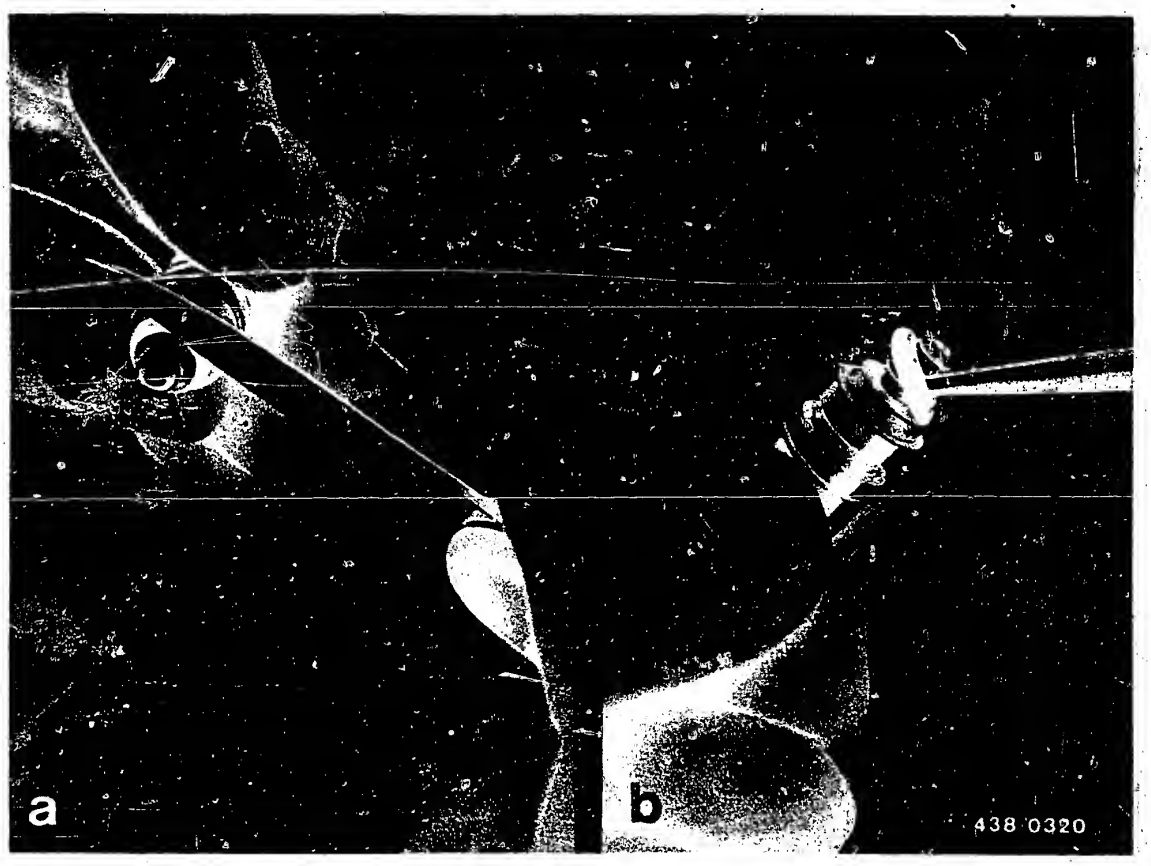
Finally, check the primary pressure and, if necessary, adjust:

Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 071 0 438 100 091	4.9...5.1 (5.0...5.2 kgf/cm²) gauge pressure



Control piston version with shaped seal ring (Fig. b):

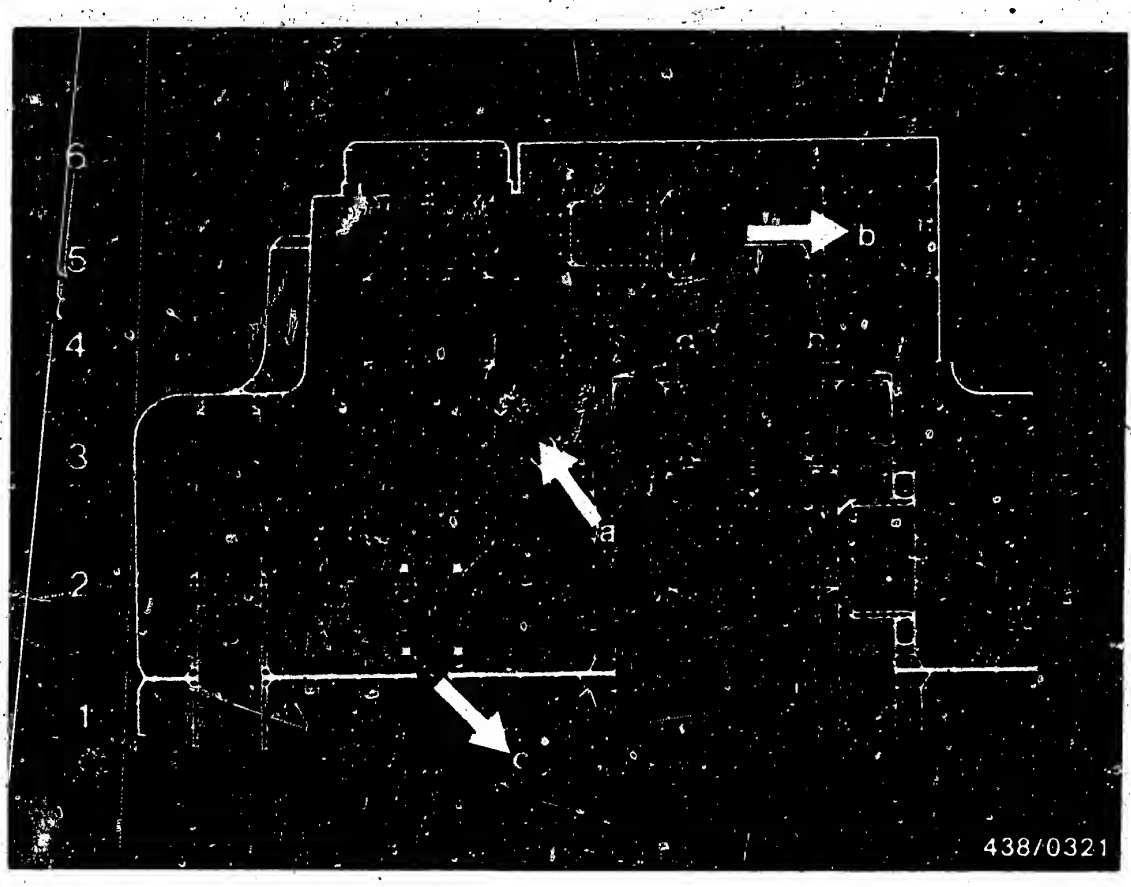
This version employs a specially shaped seal ring (Item 3) which is guided on a cylindrical peg and is held by a caulked retaining ring (Item 4).



The seal ring is changed without dismantling the retaining ring:
Cut and remove the old seal ring (Fig. a).
Pull the new seal ring over the retaining ring with a blunt marking tool (Fig. b). In doing so, do not overstretch the seal ring.
Then you must carefully check to see that the seal ring has been fitted without any damage. It must be possible to turn the retaining ring by hand. There must be a distance of approx. 0.2 mm between the retaining ring and the seal ring.

Finally, check the primary pressure and, if necessary, adjust:

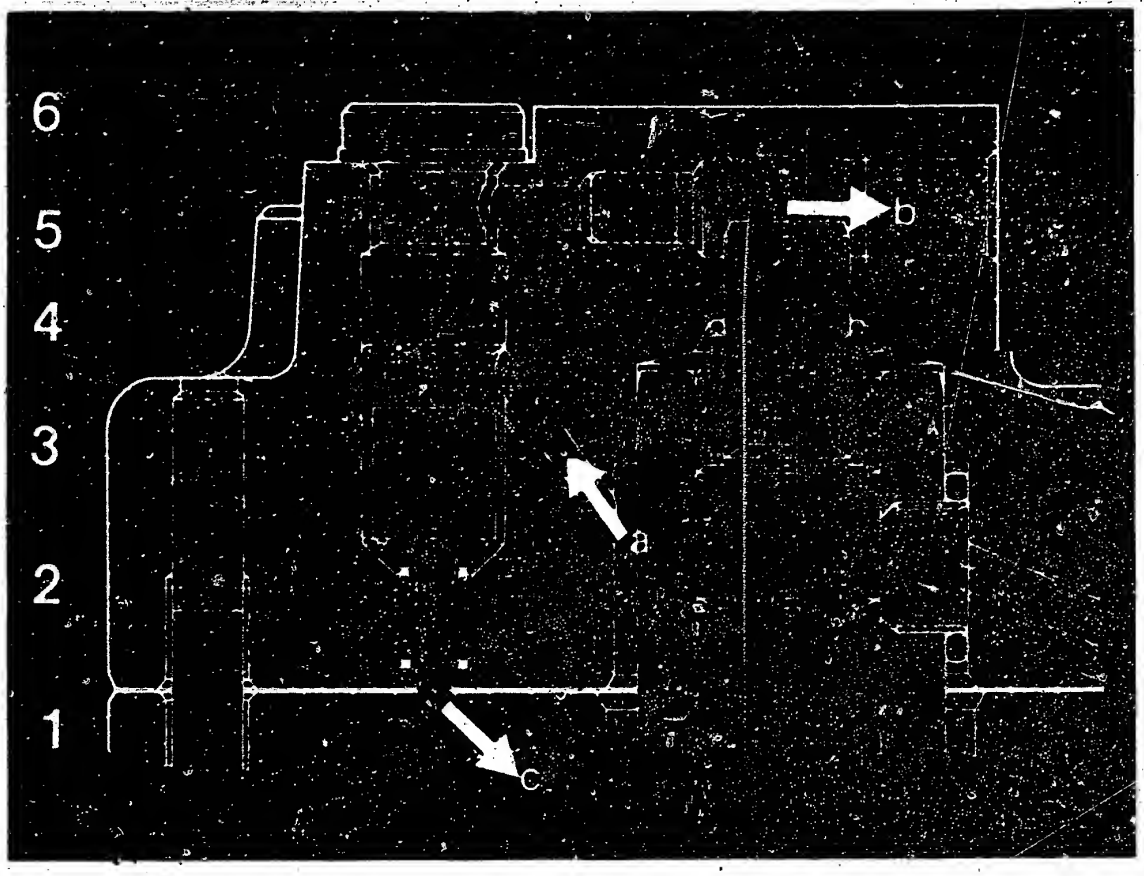
Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 071 0 438 100 091	4.9...5.1 bar (5.0...5.1 kgf/cm²) gauge pressure



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

- Pressure-relief valve on control-pressure dome of fuel distributor has a leak.

Replace the complete pressure-relief valve.
The parts set contains all items 1 to 6.



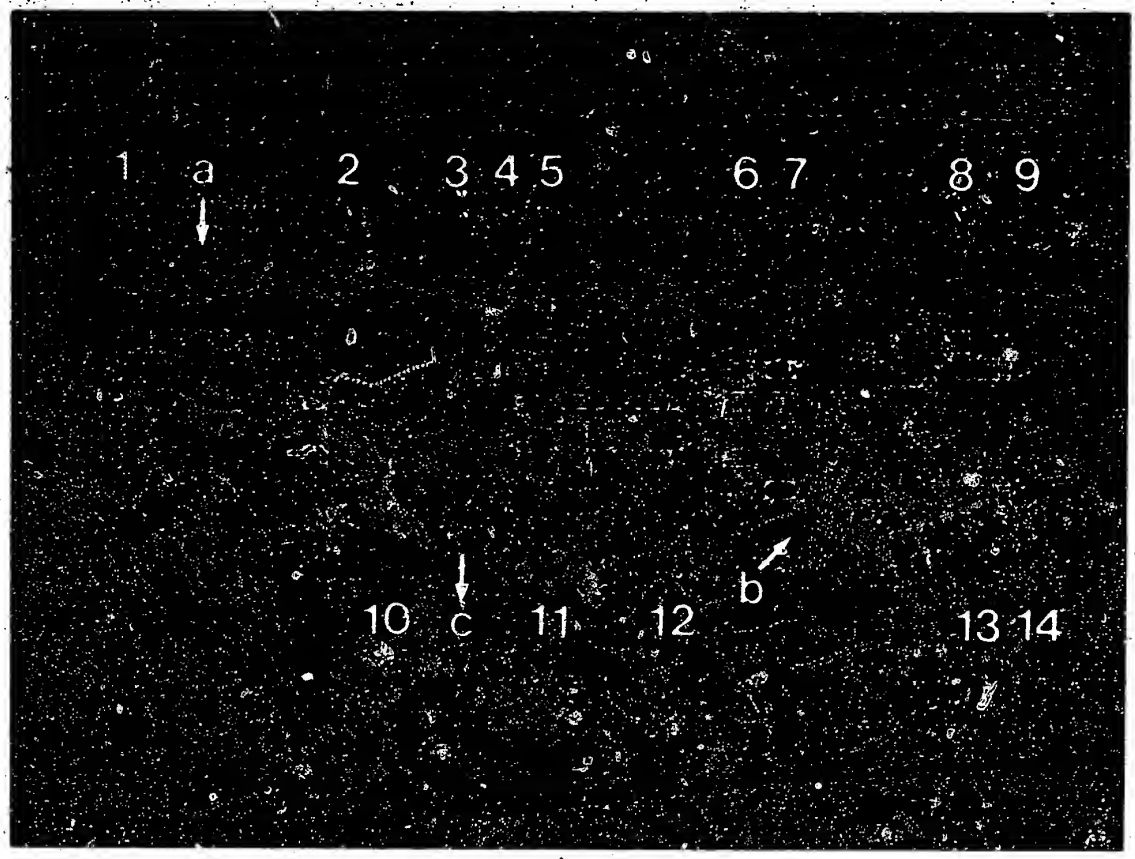
a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

Clean the fuel distributor in the area of the control-pressure dome.

Unscrew screw plug with 13 mm box wrench or, in the case of the previous version, using Torx off-set wrench size TX 730 (commercially available).

Remove the valve piston and valve spring.

Assembling the parts set:
Insert valve spring and partially assembled valve piston of parts set and seal bore with flat seal ring and screw plug.

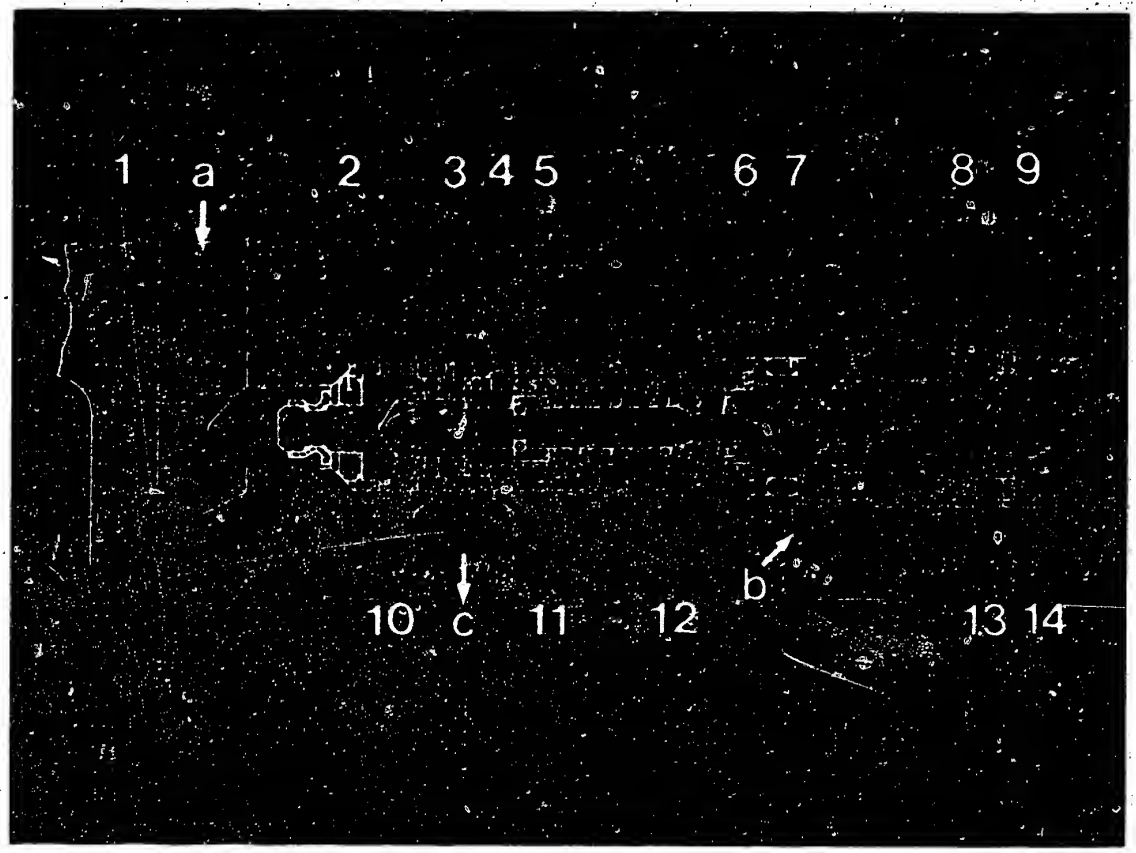


a = Primary pressure
b = From warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Spring
6 = Shims
7 = O-ring
8 = Seal ring
9 = Screw plug
10 = Valve needle
11 = Retaining ring
12 = Spring
13 = Flat seal ring
14 = Screw plug

16.5 Possible cause of trouble in the control-pressure circuit

Push-up valve in primary-pressure regulator leaking. The seal ring in the push-up valve is rigidly vulcanized onto the valve needle.



If there is a leak, therefore, it is necessary to replace the complete push-up valve (ready-assembled unit).

Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew the large screw plug (9) with the complete push-up valve. Pay attention to the control spring (5) and shims (6).
Screw in the new push-up valve with the previously found number of shims (6), a new O-ring (7) and flat seal ring (8).
Then check the primary pressure once again and, if necessary, adjust by changing the shims (6).

Primary pressure, test specifications and settings (gauge pressure)

Part No. of fuel distributor

0 438 100 071 0 438 100 091	Checking value:	4.7...5.4 bar (4.8...5.5 kgf/cm²)
	Setting value:	4.9...5.1 bar (5.0...5.2 kgf/cm²)

17. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
Caution! Do not bend steel fuel lines!
When refitting the injection valves, it is best to replace the seal rings on the valve stem (Mercedes-Benz service part) in order to prevent leaks and thus the entry of unmetered air.

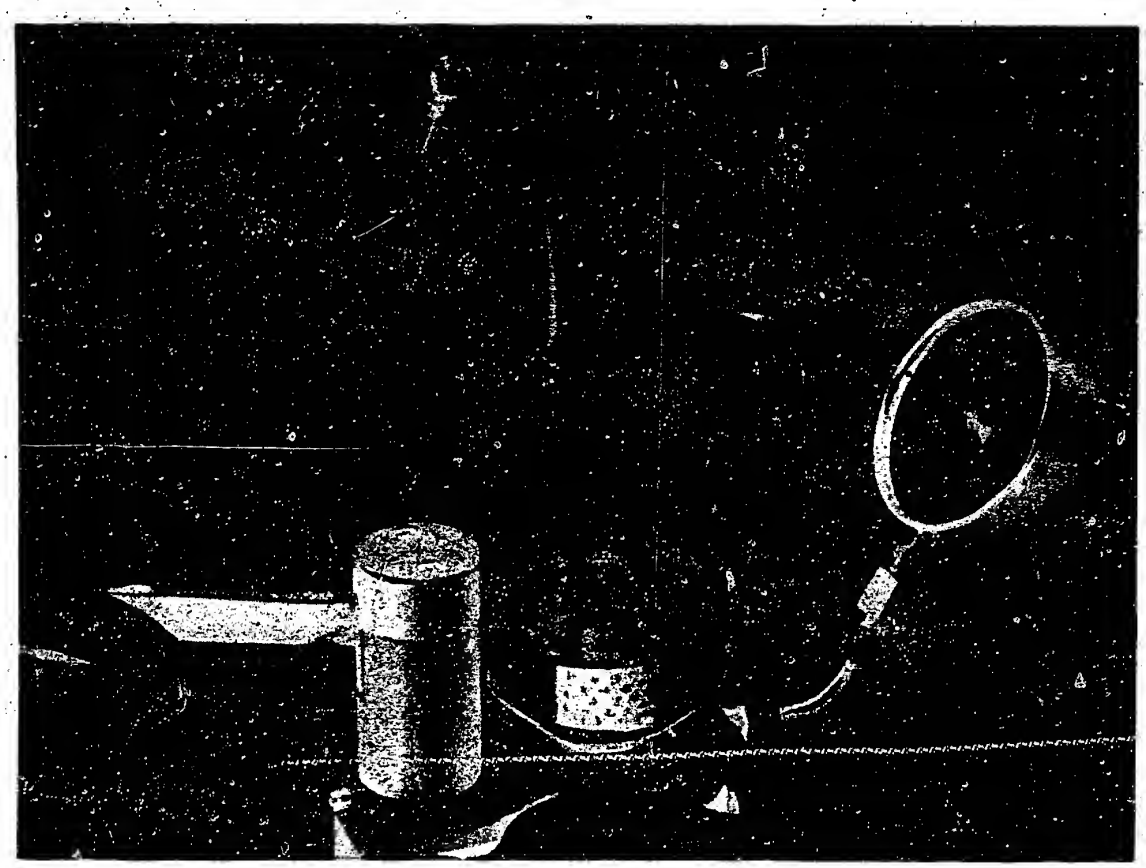
17.2 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the tes-media specification!

Test media: Calibrating fluid (Shell K30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
(previously 5 973 340 650)
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

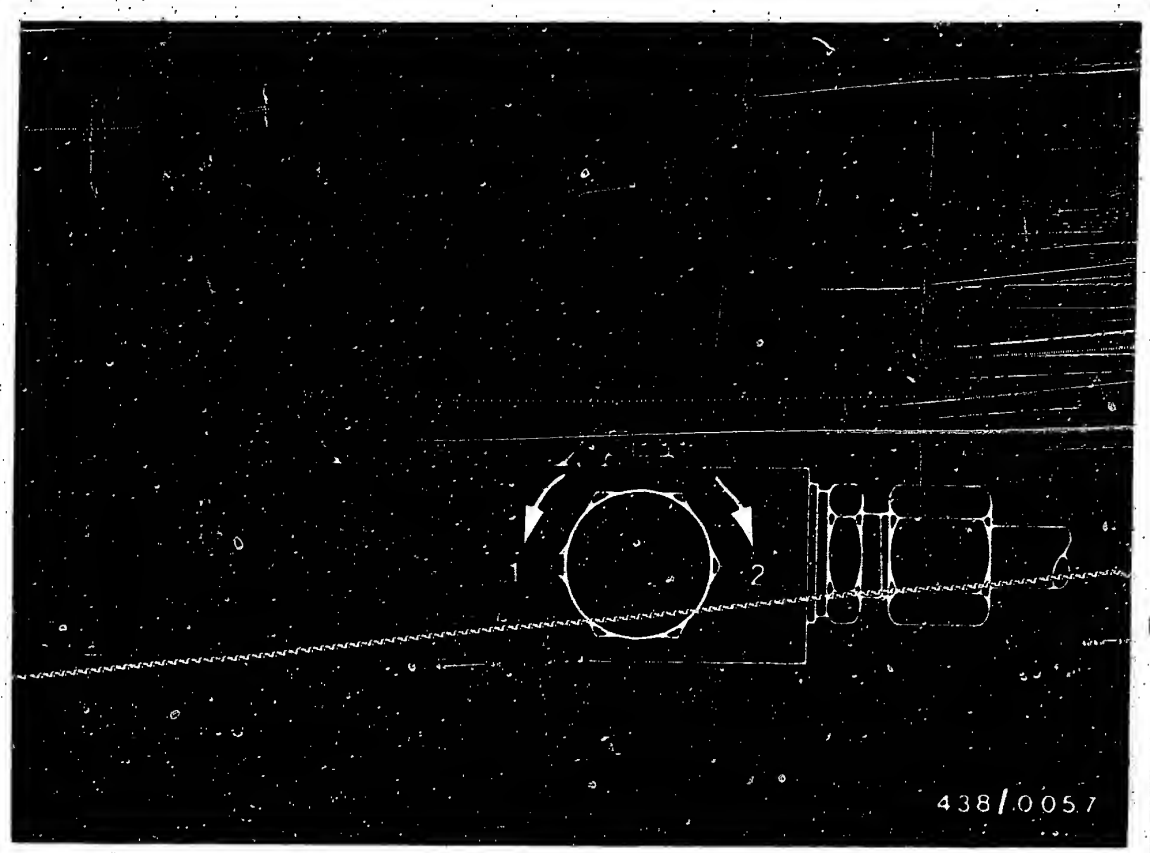


17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

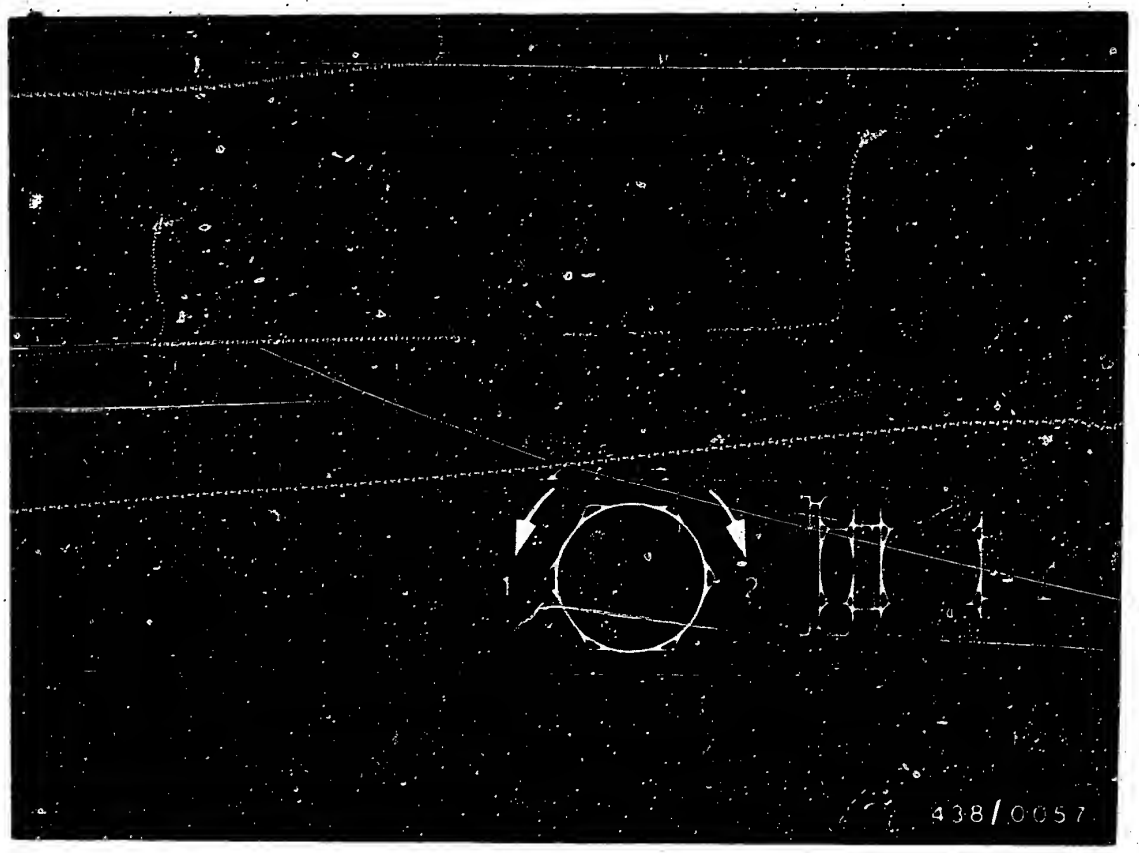
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 010	3.0...4.1 bar (3.1...4.2 kqf/cm²)



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.

438/0058

17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

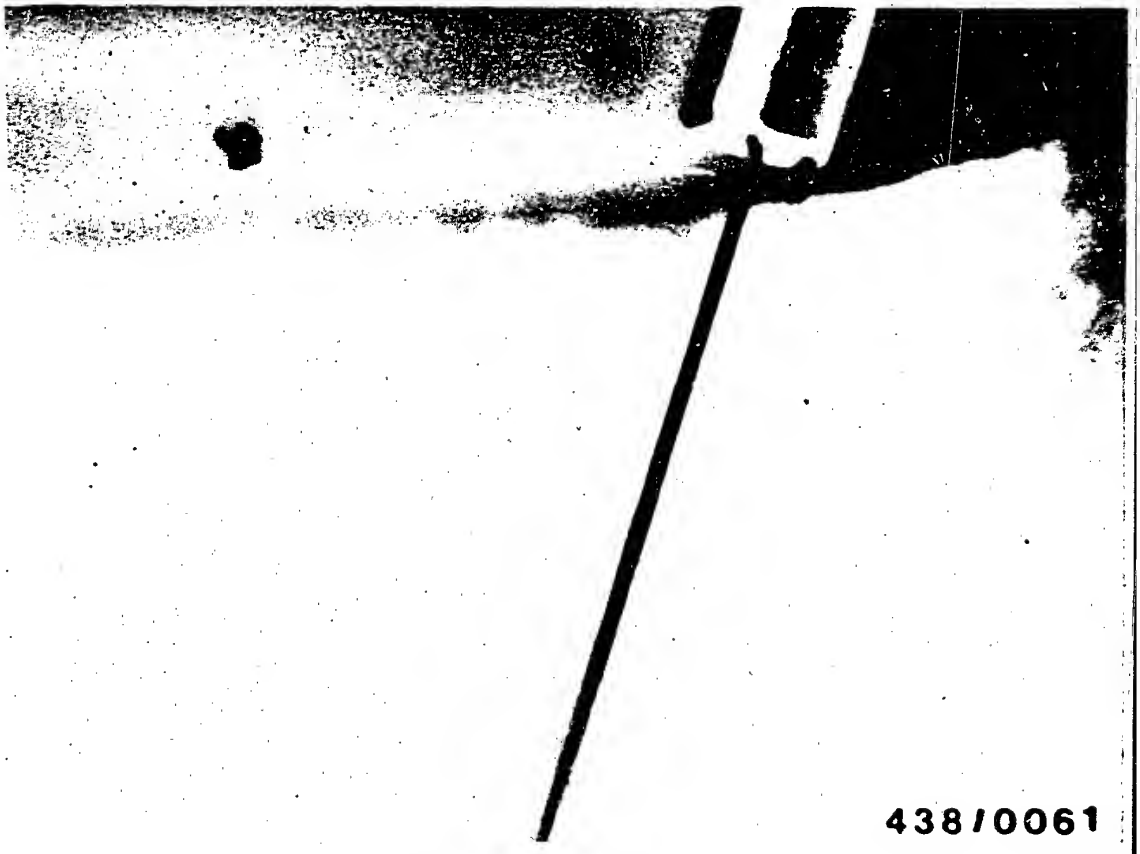
438/0059

Illustration shows single-sided but nevertheless good spray formation.

438/0060

Poor spray formation; replace injection valves.

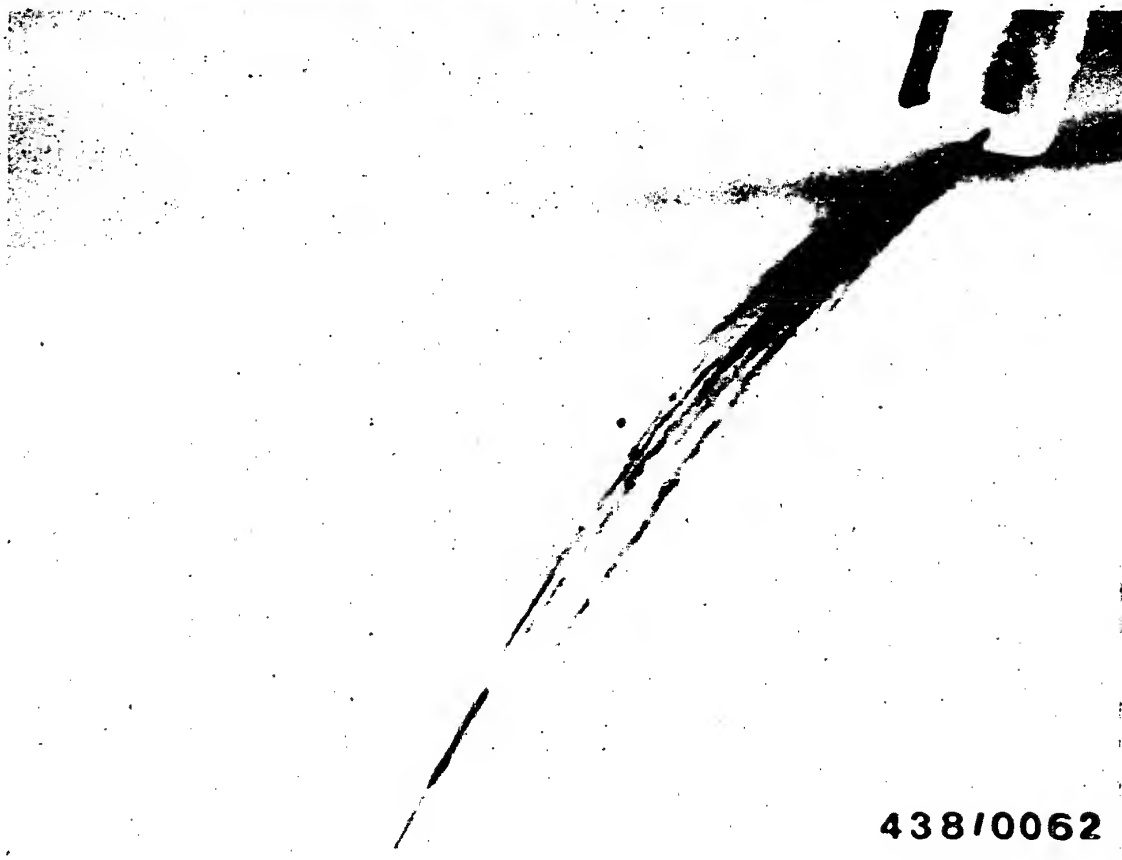
Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord spray".



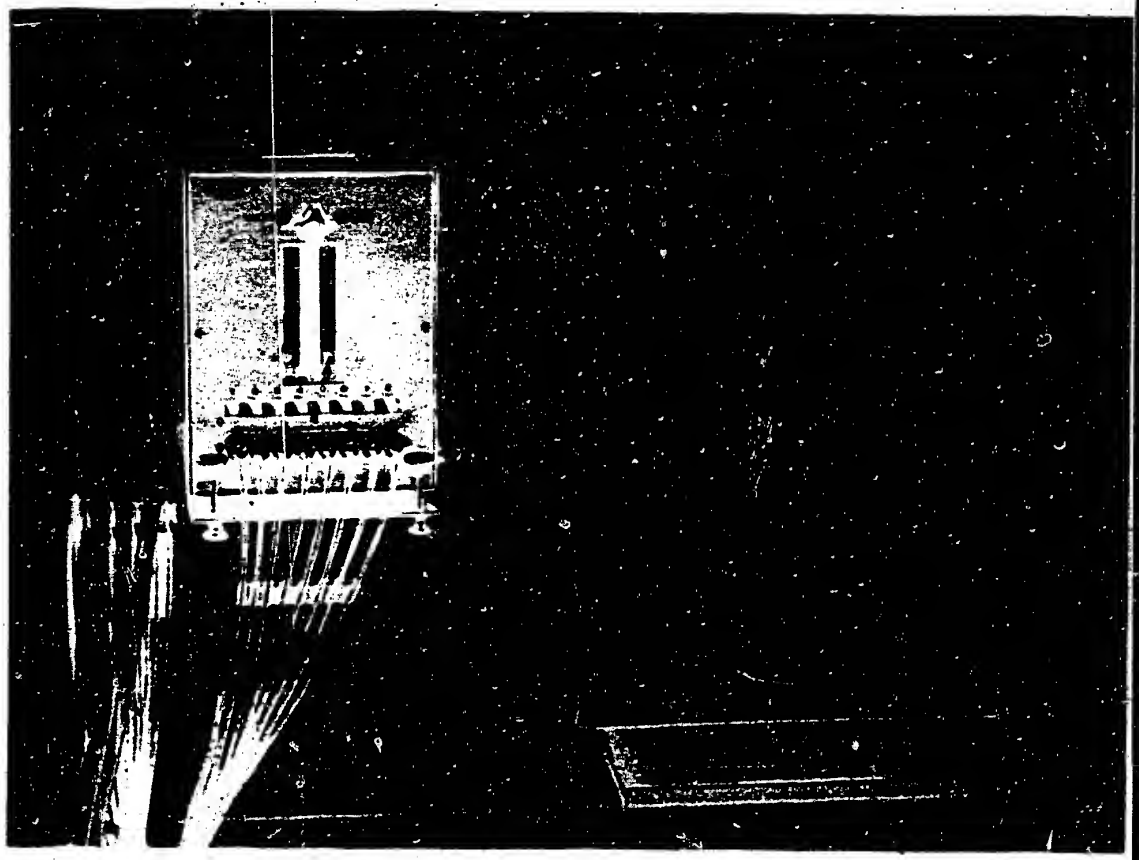
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 3.

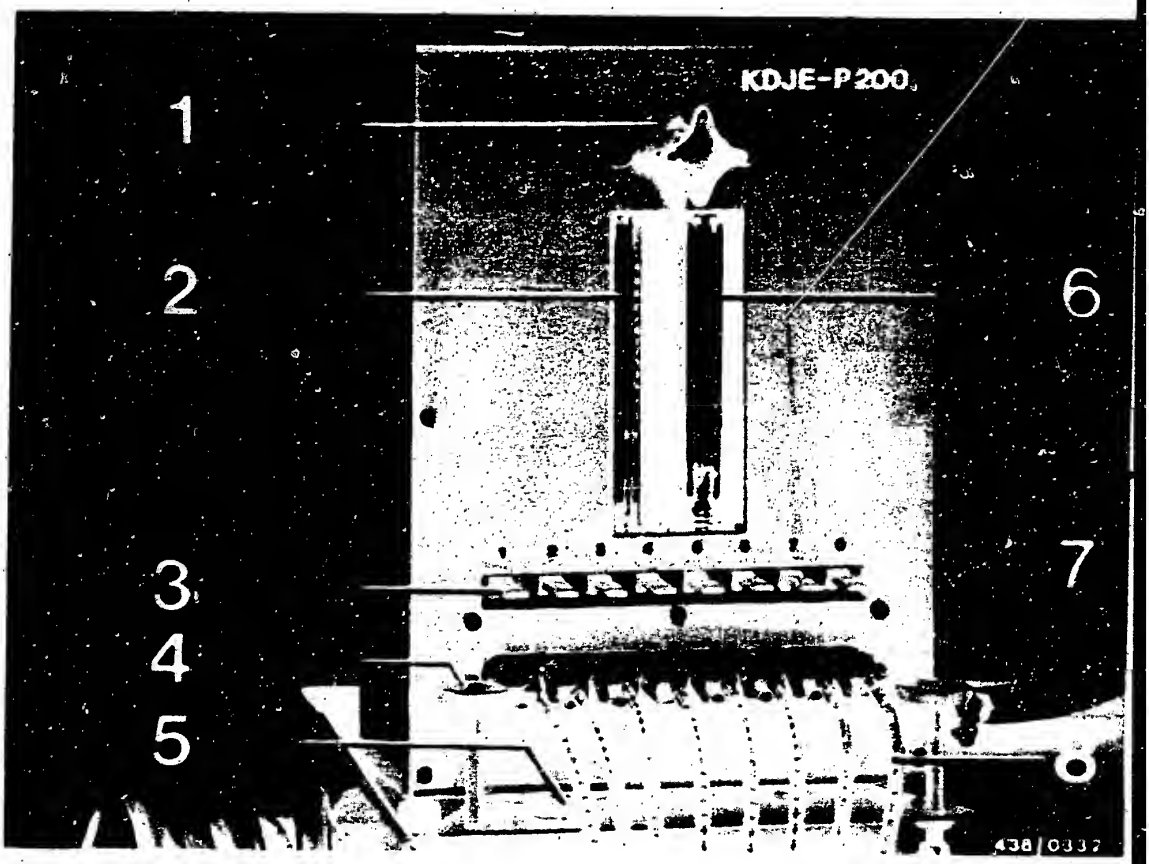


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 2-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load.

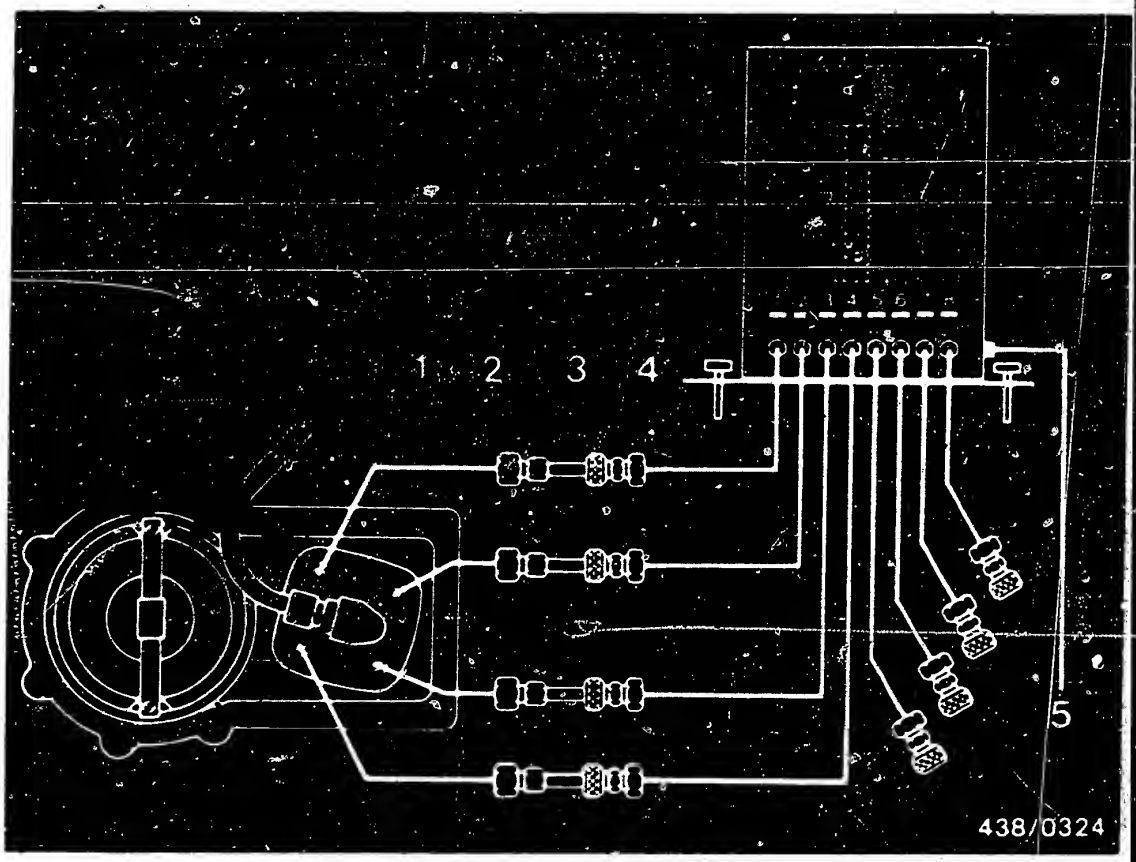
The particular rotameter tube to be used is connected by means of the 3-way stopcock.

Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Adapter connection hoses from line set KDJE-P 200/25
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

So that the rigid fuel-injection tubing is not bent too much, the tester for delivered quantity comparison is connected using the adapter connection hoses KDJE-P 200/25.

Remove the injection valves completely.

Unscrew the fuel-injection tubing from the fuel distributor and connect the adapter connection hoses instead.

Screw the injection valves onto the adapter connection hoses.

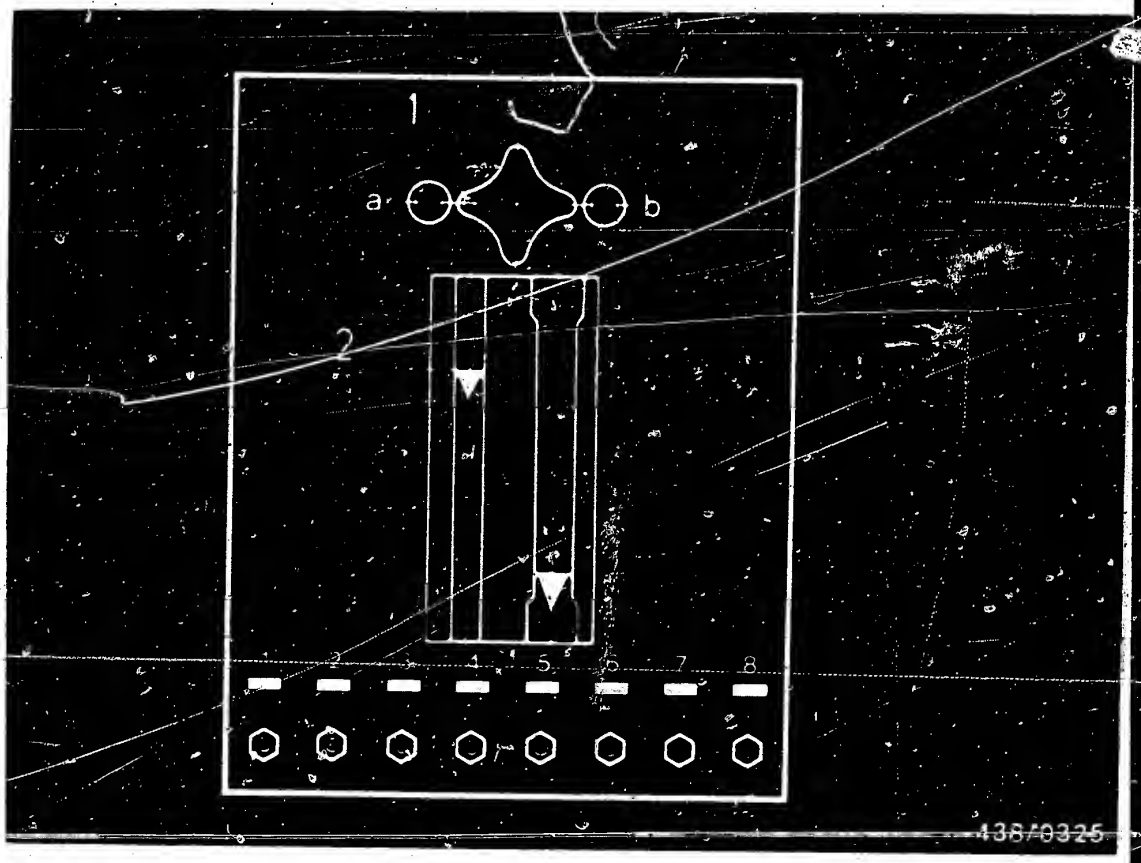
Clean the injection valves with a rag and insert injection valves into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are opened fully.

Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the air filter so that the air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Press down the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

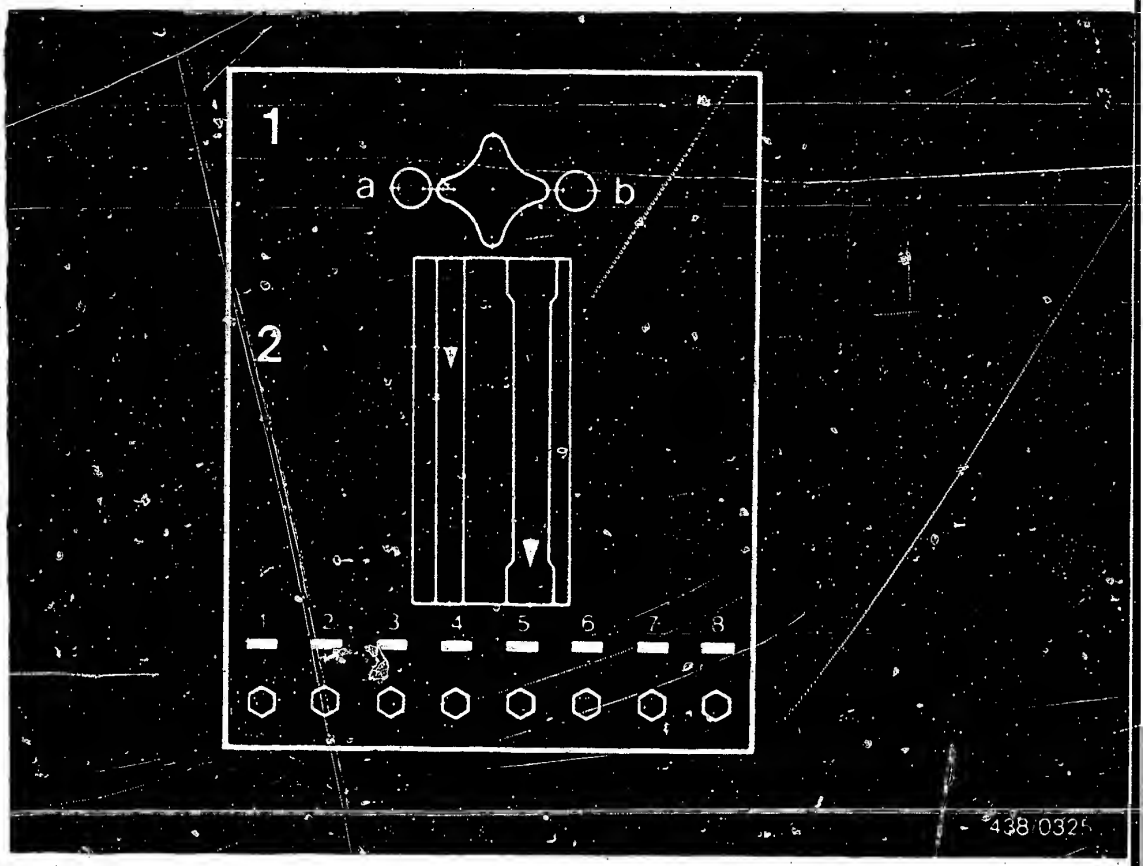


1 = White point
2 = Measuring line

a = Idle
b = Part load/full load

18.5 Testing:

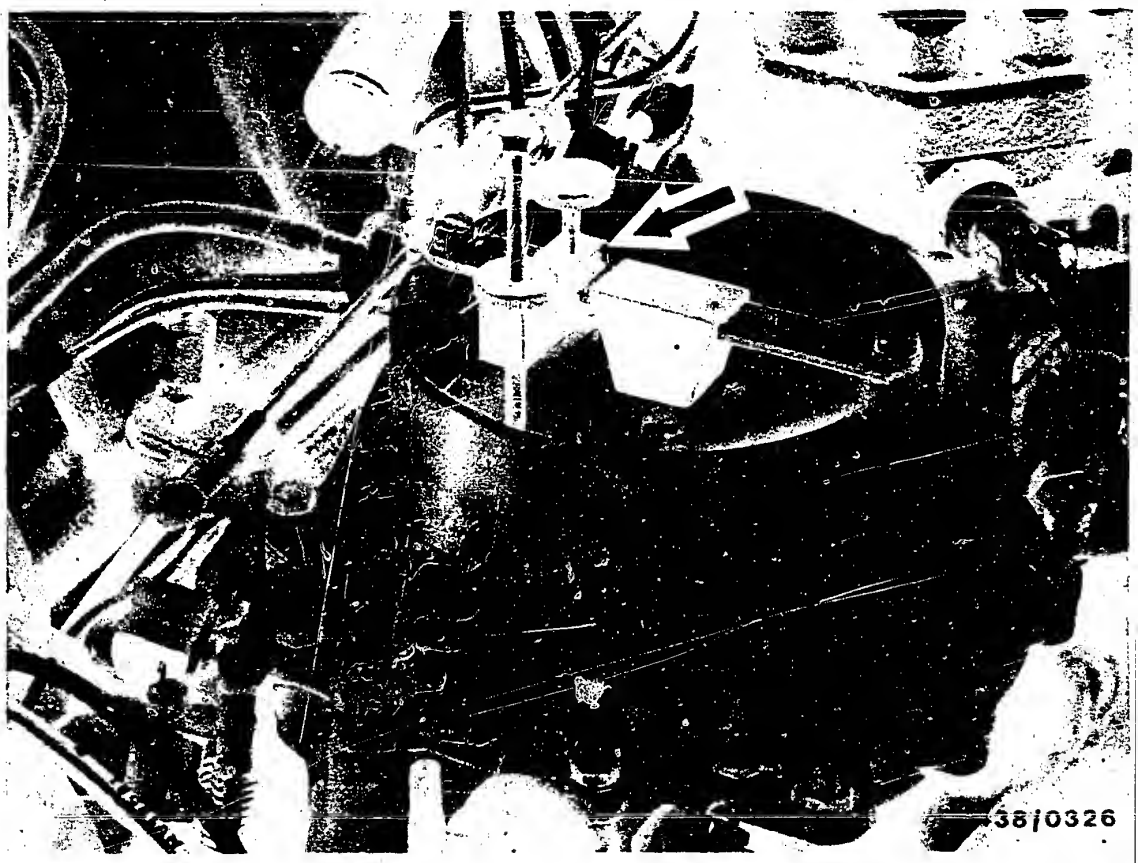
The flow comparison measurement is made in the idle part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white point to left on control knob); part-load and full-load measurements are made using the large rotameter tube (white point to right).



1 = White point
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The precise setting and fixing of the position of the air-flow sensor plate for the various load ranges is done with setting device KDJE 7456.

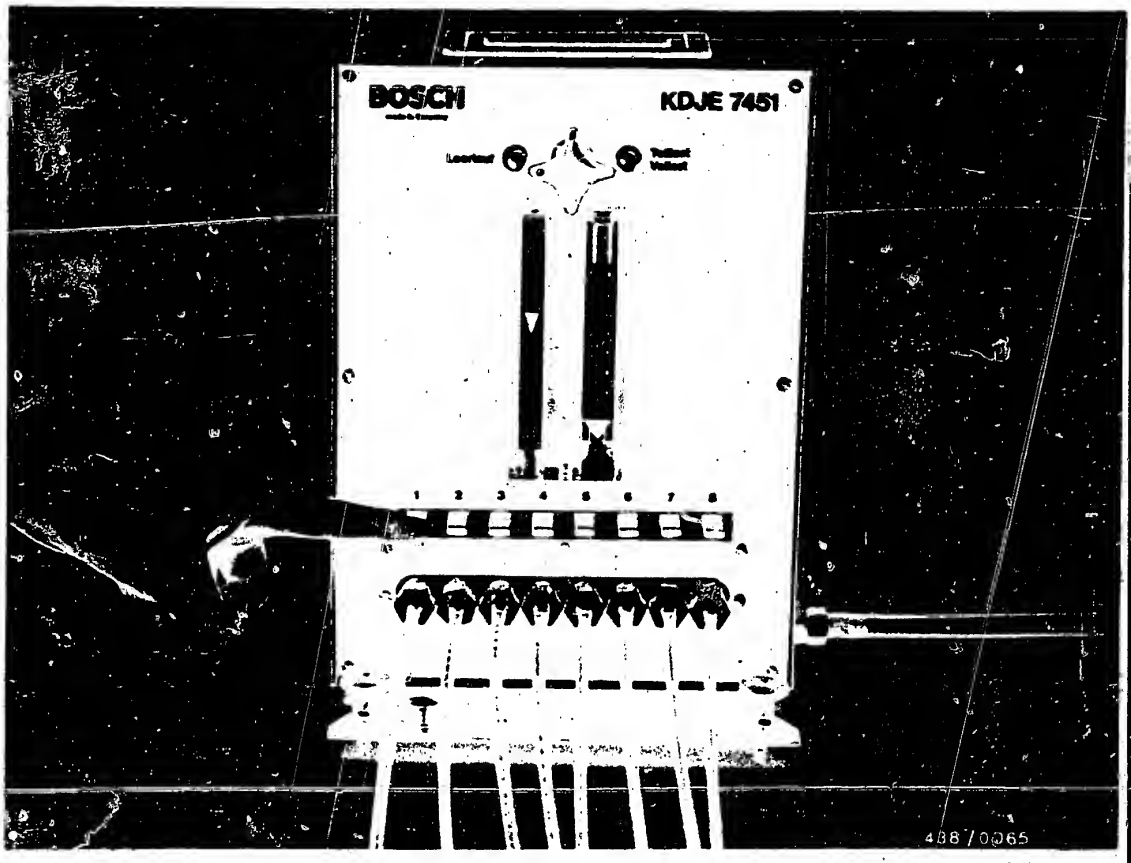
First of all, screw back the adjusting screw fully. Then clamp the setting device onto the stop bracket of the air funnel (arrow). Set the position of the air-flow sensor plate by means of the adjusting screw.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

Fuel distributor Part No. 0 438 100 071 0 438 100 091	Set point (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.6
Part load	30.0	34.0
Full load	100.0	110.0
With max. deflection of sensor plate	130.0	145.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Examine the seal rings on the fuel-injection valve stem for damage or deformation. If necessary, fit new shaped seal rings (Mercedes-Benz service part).

The air-guide sleeves are also to be checked for leaks.

Re-fit the injection valves properly. Also fit the air filter. Make sure that all lines are laid correctly. Re-connect the electrical safety circuit of the K-Jetronic properly.
Use a trial run to check that there are no leaks in line connections.

Finally check the idle-speed adjustment; if necessary, correct (Coordinates F 3).

19. Idle-speed adjustment

19.1 Test conditions, generally valid for all models:

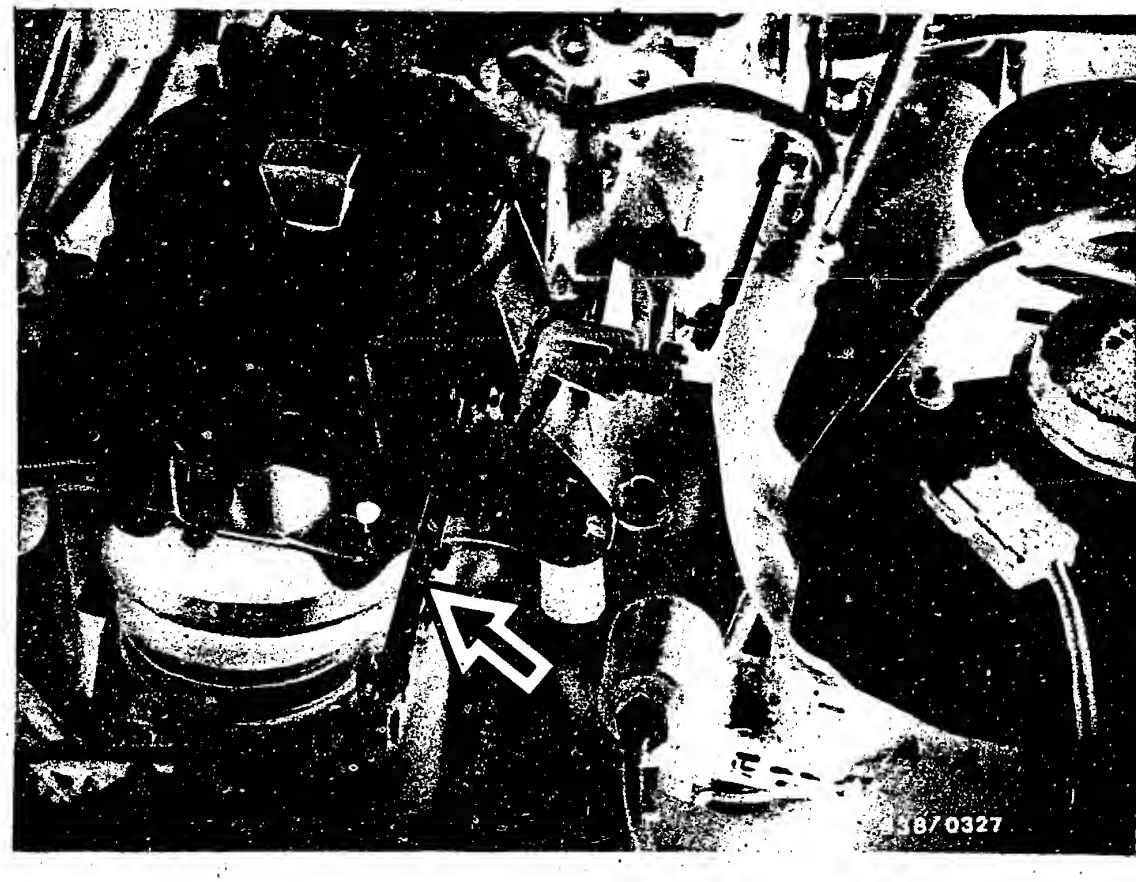
- Warm up the engine for adjusting the idle speed (oil temperature approx. 80°C).

Important note:

- If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, this should be switched off in order to stabilize the engine speed.
- In vehicles with a cruise control check whether the wire cable is up against the regulating lever free of tension. If necessary, adjust the cable with the adjusting nut.

Also make sure of the following before making the idle CO adjustment:

- The linkage for actuating the throttle valve must be set so that the throttle valve is up against the idle stop free of tension.
- As of the 1982 model the engines are equipped as standard with overrun cut-off.
  This system must be rendered inoperative for making the idle CO adjustment.
- Vehicles of the Australia and Sweden version are equipped with exhaust-gas recirculation, secondary air injection and overrun bypass air valve.
  These emission-control systems must also be switched off for making the idle adjustment.

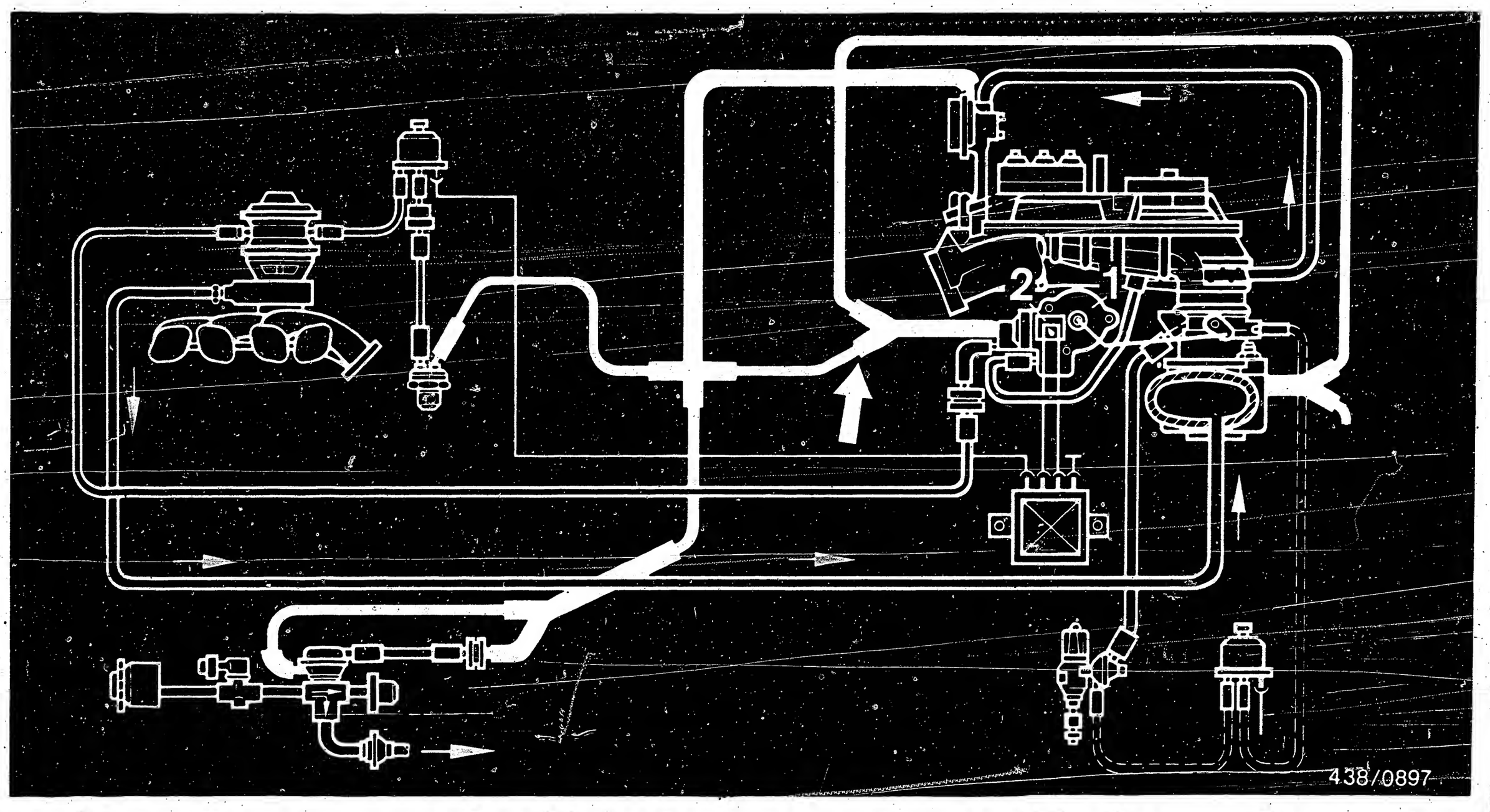


19.2 Adjusting the throttle-valve linkage

Unhook the link (arrow) from the throttle-valve assembly and check whether the throttle valve is up against the idle stop.
Hook the link back in again in such a manner that it is not under tension.
If necessary, adjust the link so that the roller in the variable-fulcrum lever is up against the end stop.
Roller must not be under tension.

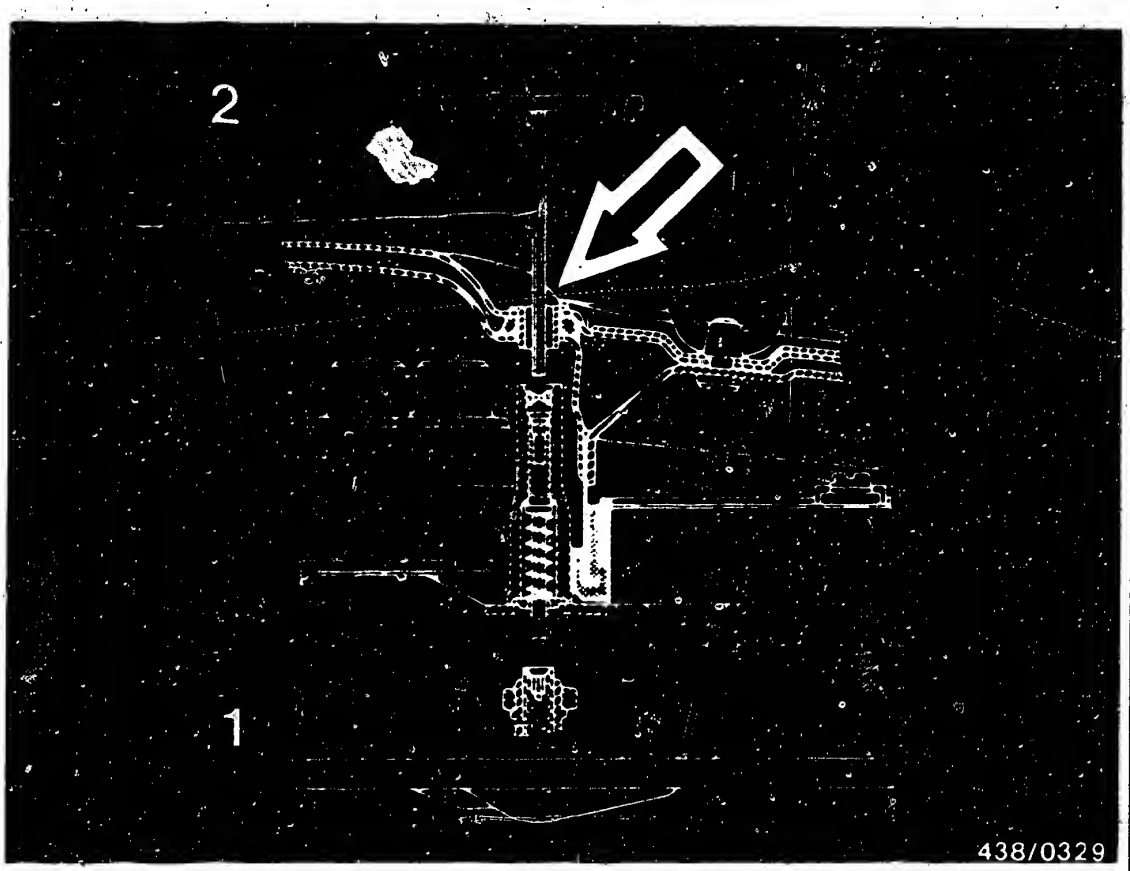
19.3 Rendering the overrun cut-off inoperative (as of 1982 model)

Remove the intake-manifold hose (arrow) from the change-over valve. Seal off tight the end of the hose and the fitting of the change-over valve.



19.4 Switching off the exhaust-gas recirculation, secondary air-injection and overrun bypass air valve

Vehicles of the Australia or Sweden version are equipped with the above-mentioned emission control systems. Before carrying out the idle test or idle adjustment, these systems must be rendered inoperative. To do this, remove the hose line (arrow) of the intake manifold control pressure and seal off tight both hose ends.



Adjusting the idle CO concentration

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit.
The CO concentration is adjusted with the air filter fitted. The adjusting wrench KDEP 1035 (2) is inserted through the specially provided opening in the air filter (arrow).
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.
To make the adjustment, carefully press down the hexagon-socket key of the setting device using the adjusting wrench until it locks in position in the idle-mixture-adjusting screw. Remove adjusting wrench after each adjustment. The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

Turning to the right = Richer mixture
Turning to the left = Leaner mixture

Caution:

Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

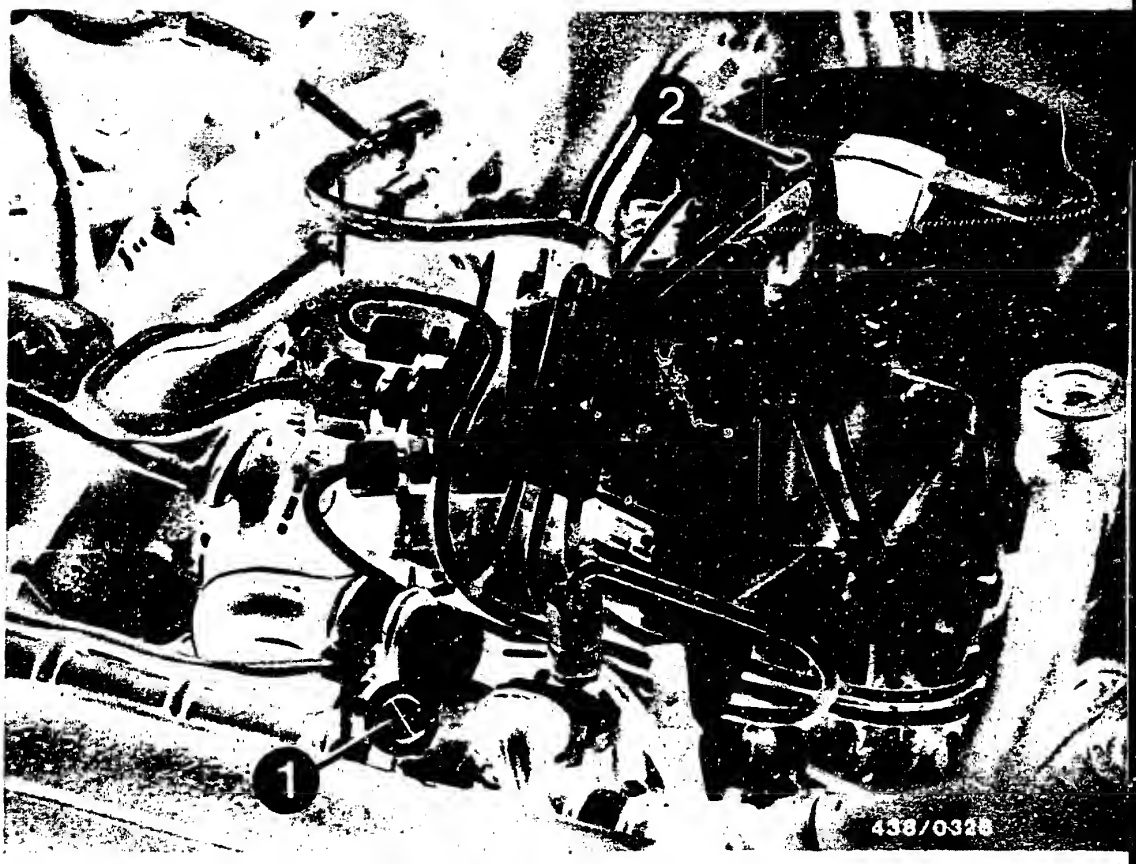
19.6 Sealing the idle-mixture-adjusting screw:

In accordance with an order amending the Federal Motor Vehicle Safety Standards, § 47, Exhaust Gases and their Discharge, has been amended. This order was printed in full in the Traffic Information Sheet 13 of 15.7.1975.

Accordingly, all motor vehicles having an engine with externally supplied ignition and being registered for the first time as of 1 October 1976 must have idle-adjusting devices which are sealed in such a way that it is not possible to adjust the screw without destroying the seal. The intention of this is to prevent non-experts from adjusting the idle setting and from impermissibly influencing the emissions. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers to use themselves.

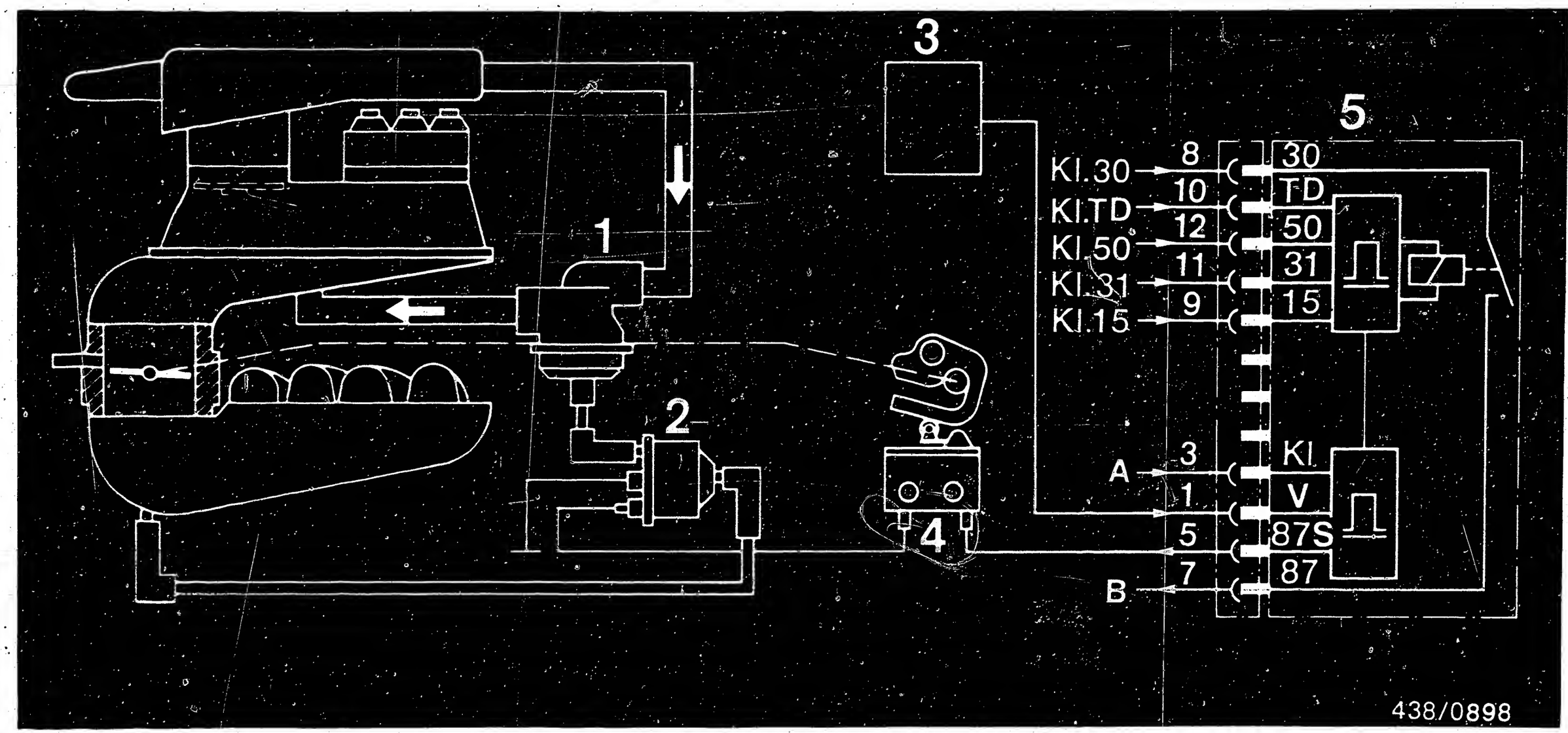
These anti-tamper caps come in different colours.
Use the following cap and colour for the after-sales service:
In the downdraft air-flow sensor:
Blue anti-tamper cap (not obtainable from Bosch).
Part number of Daimler-Benz 000.997.5686
from Deutsche Vergaser-Gesellschaft: K 34 520

The anti-tamper device is fitted and removed using special tools.



19.7 Idle test specifications and settings:

- Conditions: Engine at normal operating temperature. Air conditioner switched off. Overrun cut-off and exhaust-gas recirculation inoperative.
- The idle speed is adjusted with the air filter mounted at the bypass screw (1). The CO is adjusted at the idle-mixture adjusting screw (2) in the mixture-control unit.
- Idle speed: 700...800 $min.^{-1}$
- CO concentration: 0.5...1.5 % by vol. CO
  If necessary, finally connect the intake-manifold hose to the change-over valve of the overrun cut-off and, if necessary, to the recirculation valve of the exhaust-gas recirculation system.



20. Overrun cut-off (as of 1982 model)

1 = Overrun cut-off valve
2 = Change-over valve
3 = Speedometer generator
4 = Throttle-valve microswitch
5 = Electronic relay (for safety circuit and overrun cut-off)
A = From air conditioner
B = To warm-up regulator, auxiliary-air device and electric fuel pump

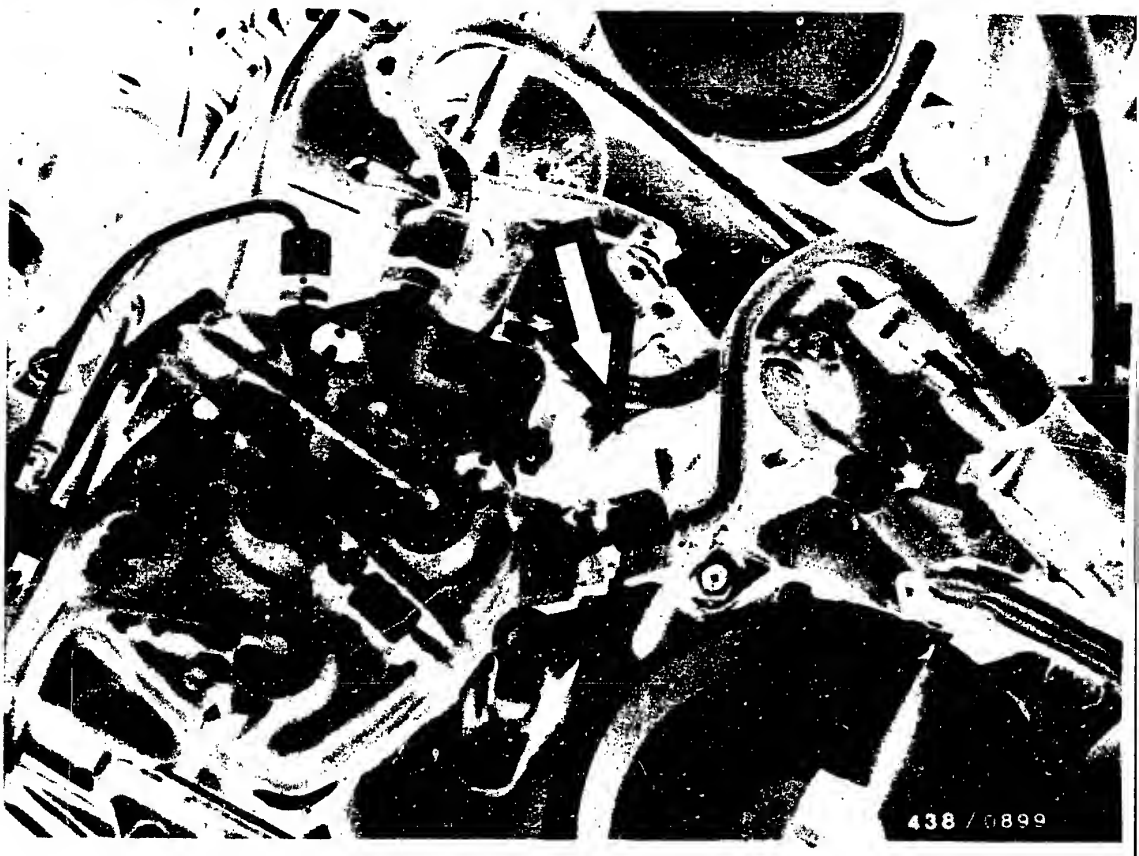
20.1 Operation:

The electronic relay receives engine-speed pulses from terminal TD of the ignition trigger box and road speed pulses from the speedometer generator at input 1 (terminal V).

If the engine speed is greater than 1100 min^{-1} (vehicles without air conditioner) or greater than 1300 min^{-1} (vehicles with air conditioner) and the road speed is greater than 30 km/h, then battery voltage is applied to output 5 (terminal 87S) of the relay.

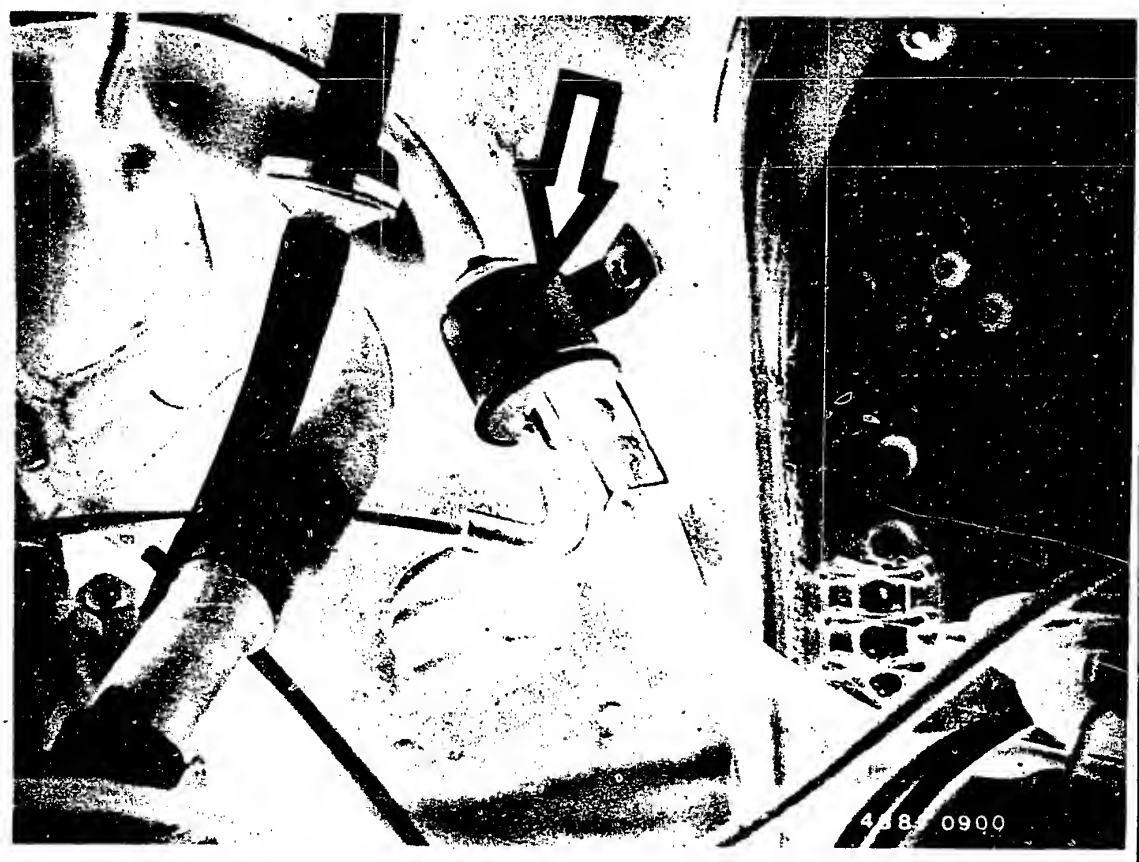
With the throttle-valve switch closed (idle position) the voltage is applied to the change-over valve.
The change-over valve opens and the intake-manifold pressure acts on the overrun cut-off valve.
With the overrun cut-off valve opened, the air quantity drawn in by the engine bypasses the air-flow sensor.
The air-flow sensor plate remains in the rest position, and no fuel is metered or injected.

If one of these conditions is changed, the overrun cut-off valve closes and the normal fuel metering resumes.

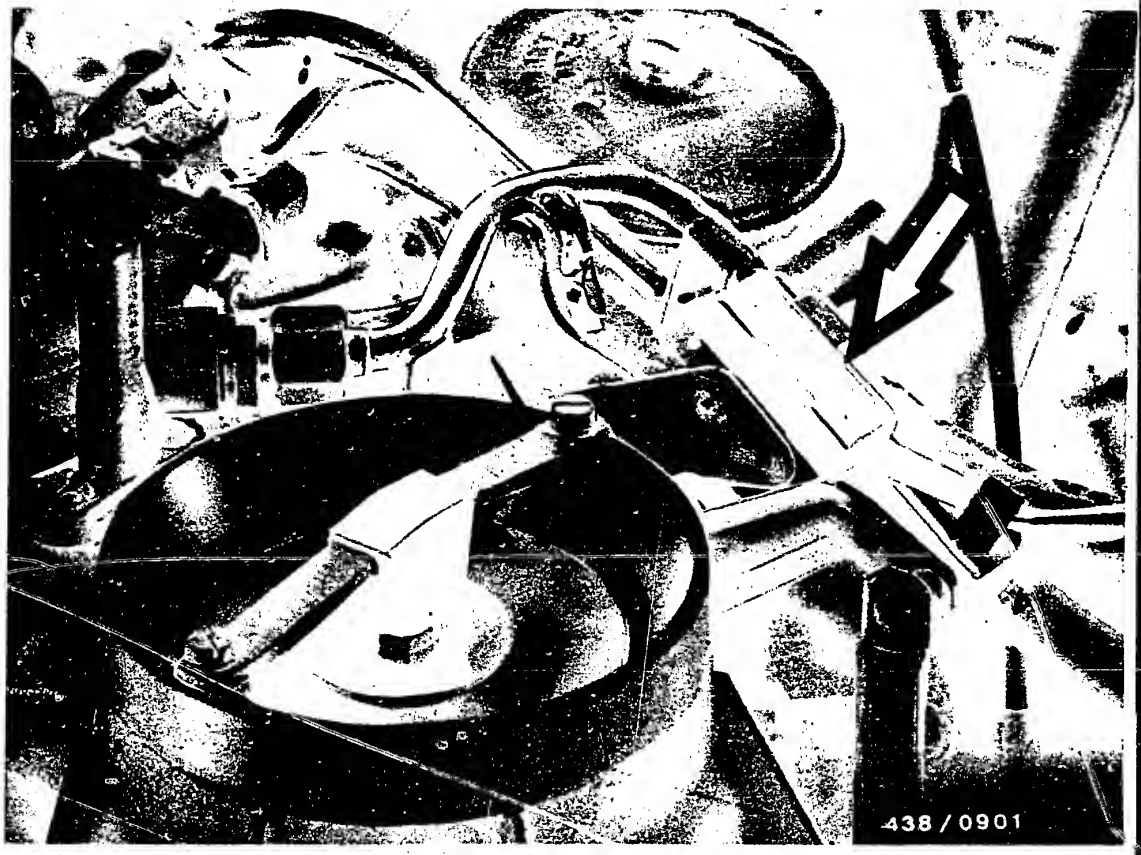


20.2 Installation position of components

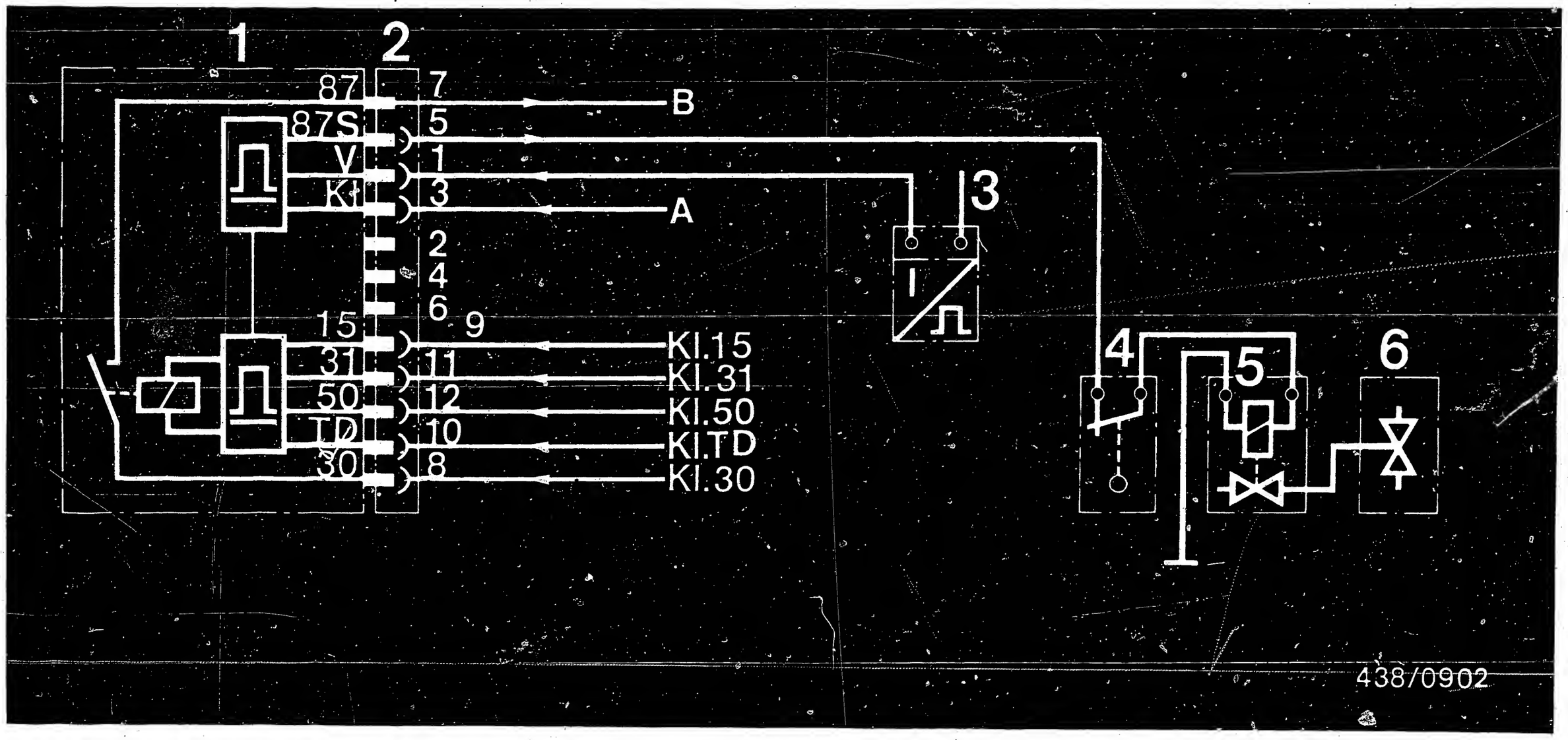
- Arrow = Overrun cut-off valve under intake manifold.



- Arrow = Change-over valve, on left-hand spray protector.



- Arrow = Throttle-valve microswitch on shift linkage.
- The speedometer generator is installed in the speedometer of the instrument panel.
- The electrical functions of the overrun cut-off are integrated in the electronic relay of the safety circuit.



20.3 Electrical circuit diagram

1 = Electronic relay (for safety circuit and overrun cut-off)
2 = Plug socket
3 = Speedometer generator
4 = Throttle-valve microswitch
5 = Change-over valve
6 = Overrun cut-off valve
A = From air conditioner
B = To warm-up regulator, auxiliary-air device and electric fuel pump

20.4 Electrical tests

• Test the voltage supply to the electronic relay in the plug base:

At pin 1 = terminal V pulses from speedometer generator
At pin 3 = terminal K1, voltage from air conditioner
At pin 8 = positive from terminal 30 (battery)
At pin 9 = positive from terminal 15 (ignition)
At pin 10 = pulses from terminal TD (ignition trigger box)
At pin 11 = ground from terminal 31
At pin 12 = positive from terminal 50 (starting motor)

• Test the outputs of the relay:

At pin 5 = positive from terminal 87S (overrun cut-off)
At pin 7 = positive from terminal 87 (warm-up regulator, auxiliary-air device and electric fuel pump)

• Test the electrical connecting leads:
From terminal 87S of the electronic relay to the throttle-valve microswitch.
From the throttle-valve microswitch to the change-over valve.
From the change-over valve to vehicle ground.

Test all leads for continuity and correct connection.
Output 7 (terminal 87) only has battery voltage when engine running.
Output 5 (terminal 87S) only has battery voltage when engine speed greater than 1100 min^{-1} (vehicles without air conditioner) or 1300 min^{-1} (vehicles with air conditioner) and road speed greater than 30 km/h.

20.5 Functional test of components

- Overrun cut-off valve

Let the engine idle.
Remove intake-manifold hoses from change-over valve and connect to each other.
The overrun cut-off valve opens, the engine stops.

- Change-over valve

Let the engine idle.
Apply battery voltage to the change-over valve.
The change-over valve opens, the engine stops.

- Throttle-valve microswitch

Test for continuity with ohmmeter. In the idle position the contact must be closed; in the part-load and full-load positions it must be open.
When the accelerator is operated the contact of the microswitch is opened during the free travel (i.e. throttle valve still in idle position).

- Electronic relay

Carry out functional test on chassis dynamometer or road test since, in addition to engine-speed pulses, pulses from speedometer generator are also required.
At engine speed greater than 1100 min^{-1} (vehicles without air conditioner) or 1300 min^{-1} (vehicles with air conditioner) and at a road speed greater than 30 km/h, battery voltage must be present at output 5 (terminal 87S).
At a lower engine speed or road speed, there is again no voltage across output 5.

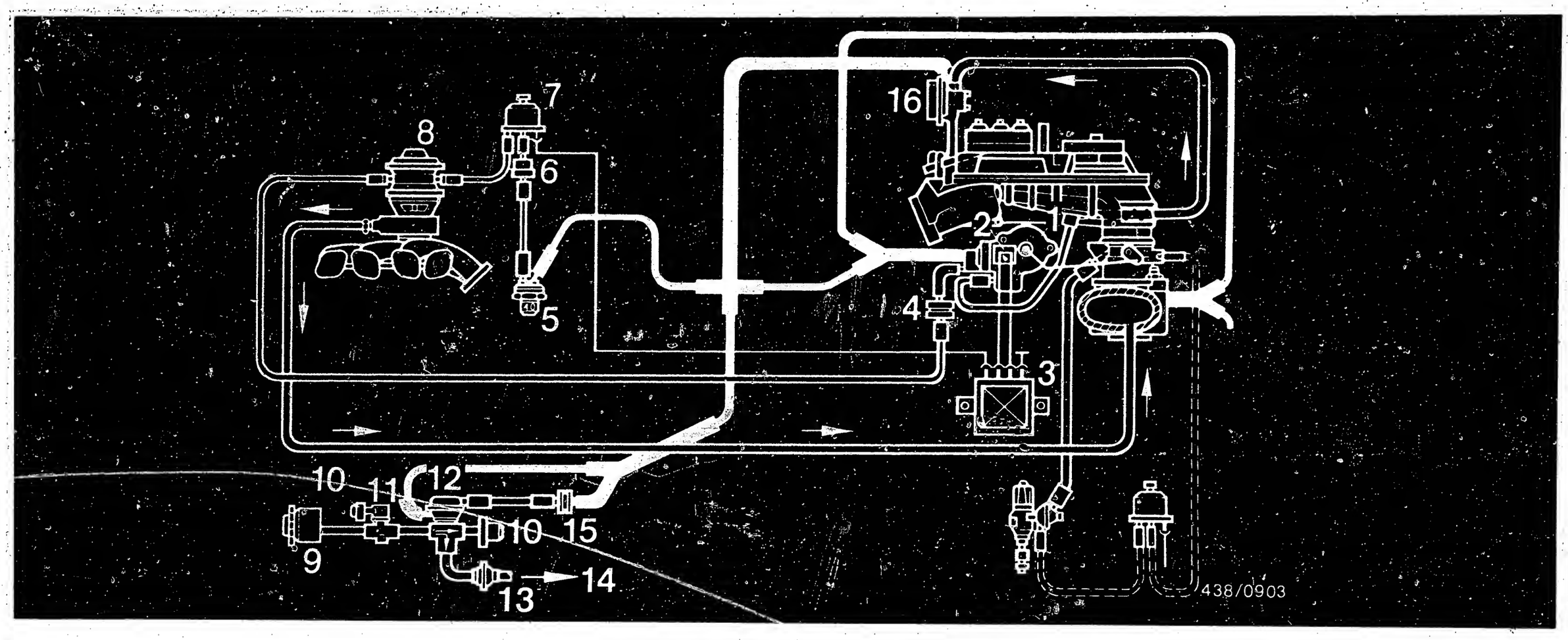
2.1 Emission control

Vehicles for Australia and Sweden are additionally equipped with the following systems:

- Exhaust-gas recirculation
- Secondary air injection
- Overrun bypass air valve

Exhaust-gas recirculation and secondary air injection reduce the proportion of noxious pollutants in the exhaust gas. The overrun bypass air valve, installed only in vehicles with manually-shifted transmission, ensures that there is an increase in engine speed after starting as well as improved combustion on the overrun.

All three systems (not made by Bosch) also influence the fuel consumption and power apart from the composition of the exhaust gas.
The construction, operation and layouts of lines are explained in the following sections.



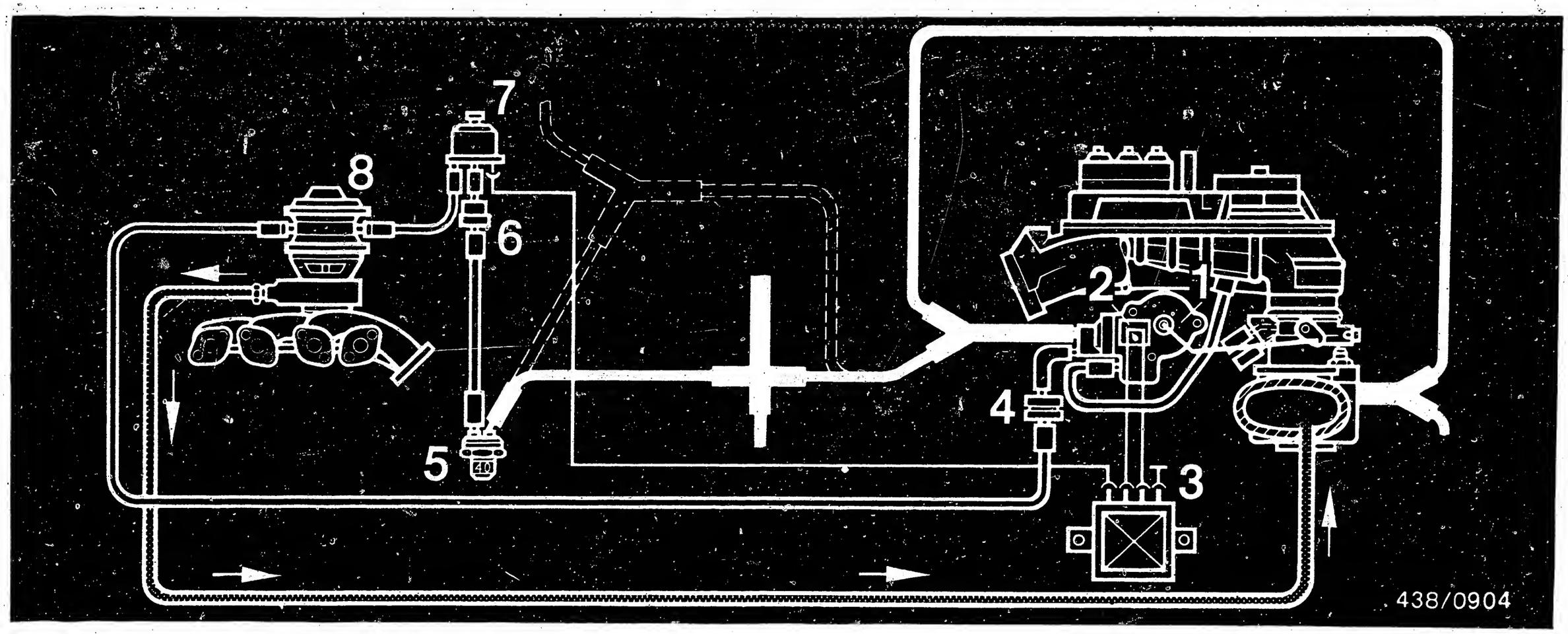
21.1 Diagram of air lines

Exhaust-gas recirculation
1 = Vacuum control valve
2 = Throttle-valve switch
3 = Relay box
4 = Vacuum restriction
5 = Thermo-valve 40°C
6 = Non-return valve
7 = Change-over valve
8 = EGR valve

Secondary air injection
9 = Air pump
10 = Damper filter
11 = Overpressure valve
12 = Blow-off overrun valve
13 = Non-return valve
14 = Injection line to exhaust manifold
15 = Delay valve

Overrun bypass air valve
16 = Overrun bypass air valve

▬ = Directly acting intake-manifold pressure

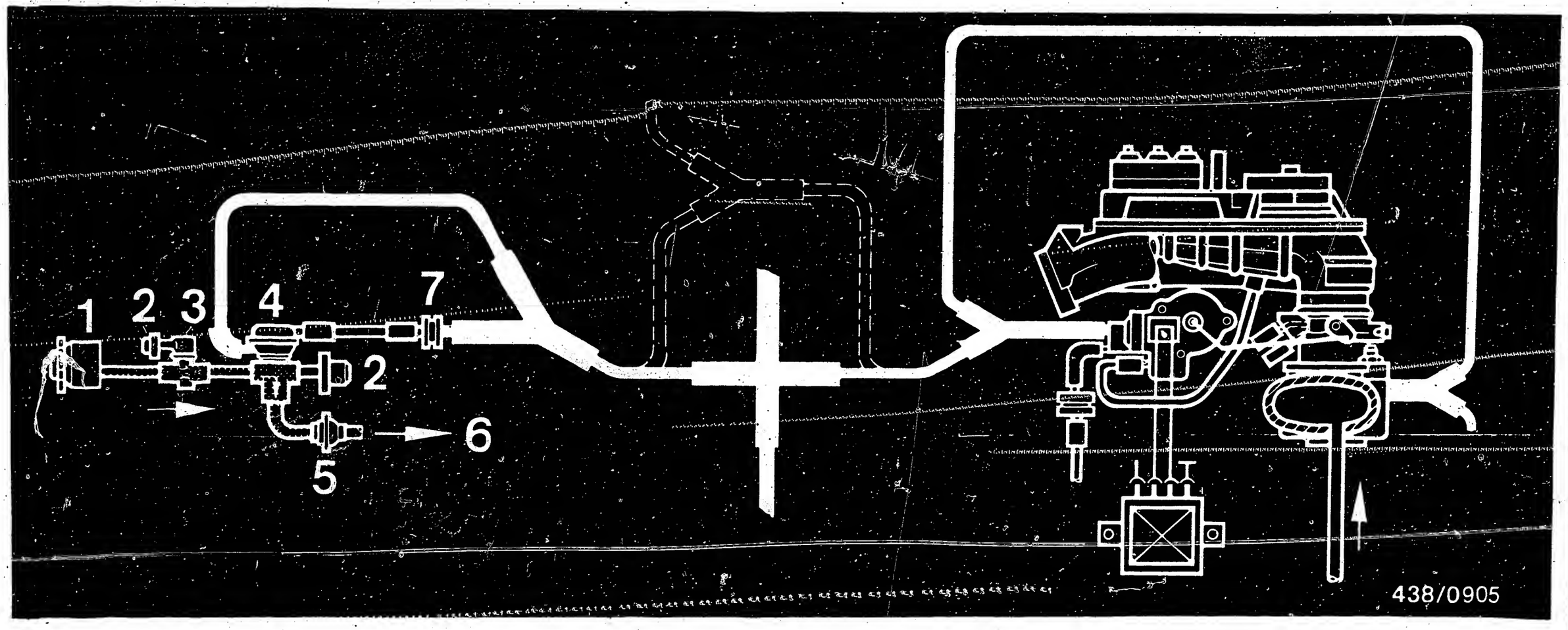


21.2 Exhaust-gas recirculation (not made by Bosch)

1 = Vacuum-control valve
2 = Throttle-valve switch
3 = Relay box
4 = Vacuum restriction
5 = Thermo-valve 40°C
6 = Non-return valve
7 = Change-over valve
8 = EGR valve

■ = Directly acting intake-manifold pressure
▨ = Recirculated exhaust gas

Some of the exhaust gas is recirculated via the vacuum-controlled EGR valve to the intake manifold and takes part once again in combustion. Vacuum-control valve, throttle-valve switch and relay box as well as thermo-valve and change-over valve ensure that exhaust gas is only recirculated when the engine is warm and operating in the part-load range. At idle, full load and also when the engine is cold, the exhaust-gas recirulation system is inoperative.



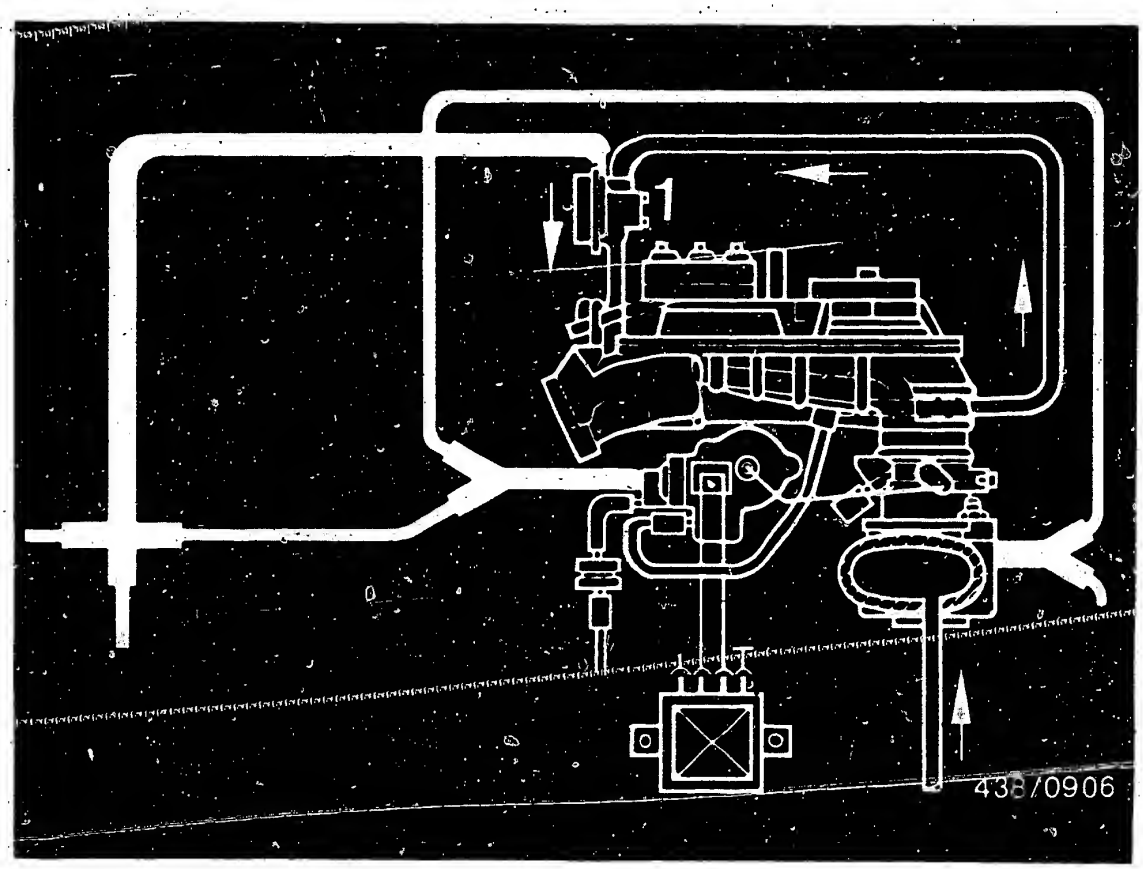
21.3 Secondary air injection (not made by Bosch)

1 = Air pump
2 = Damper filter
3 = Overpressure valve
4 = Blow-off overrun valve
5 = Non-return valve
6 = Injection line to exhaust manifold
7 = Delay valve

= Directly acting intake-manifold pressure

= Fresh air

An engine-driven air pump forces fresh air through a vacuum-controlled blow-off overrun valve and a non-return valve into the exhaust ports for afterburning. The overpressure valve and delay valve control the operation of the air injection system.



21.4 Overrun bypass air valve (not made by Bosch)

1 = Overrun bypass air valve

■ = Intake-manifold pressure

Vehicles with manually-shifted transmission are equipped with an overrun bypass air valve. This valve acts as a bypass around the throttle valve and causes an increase in engine speed after starting as well as improved combustion on the overrun.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich Kfz-Kundendienst, Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung

After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
5.1982
(replaces Ed. 3.1982

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 001	1 587 010 500	---	---
.. 002	.. 500	---	---
.. 950 }	1 587 010 006	---	---
.. 951 }		---	---
.. 952	1 587 010 002	---	---
.. 953	.. 501	---	---
.. 954	.. 002	---	---
.. 956	.. 002	---	---
.. 957	.. 002	---	---
.. 958	.. 002	---	---
.. 959	.. 002	---	---
.. 960	.. 002	---	---
.. 961	.. 002	---	---
.. 962	.. 002	---	---
.. 963	.. 005	---	---
.. 964	.. 002	---	---
.. 965	.. 002	---	---
.. 966	.. 002	---	---
.. 967	.. 002	---	---
.. 968	.. 002	---	---
.. 969	.. 002	---	---
.. 970	.. 002	---	---
.. 971	.. 002	---	---
.. 972	.. 002	---	---
.. 973	.. 002	---	---
.. 974	.. 002	---	---
.. 975	.. 003 [4]	---	---
.. 976	.. 004 [3]	---	---
.. 977	.. 004 [3]	---	---
.. 978	1 587 410 901	---	---
.. 979	010 004 [3]	---	---
.. 980	.. 002	---	---
.. 981	.. 002	---	---

[3] = Parts set ... 003 also possible (delivery line connection at 90°)
[4] = Parts set ... 004 also possible (delivery line connection axial)

BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
.. 982 [1]	.. 003 [4]	---	---
.. 982 [2]	1 587 410 901	---	---
.. 984	010 004 [3]	---	---
0 580 254 985	---	1 583 385 006	1 580 203 002
.. 986	---	.. 386 011	.. 001
.. 987	---	 008	.. 001
.. 988	---	.. 008	.. 001
.. 989	---	.. 008	.. 001
.. 990	---	.. 385 004	.. 002
.. 991	---	.. 004	.. 002
.. 992	1 587 010 001	---	---
.. 996	---	.. 386 011	.. 001
.. 998	---	.. 385 004	.. 002

[1] = until FD 822

[2] = from FD 823

[3] = Parts set ... 003 also possible (delivery line connection at 90°)

[4] = Parts set ... 004 also possible (delivery line connection axial)

Please direct questions and comments concerning the contents to our authorized representative in your country.

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5...

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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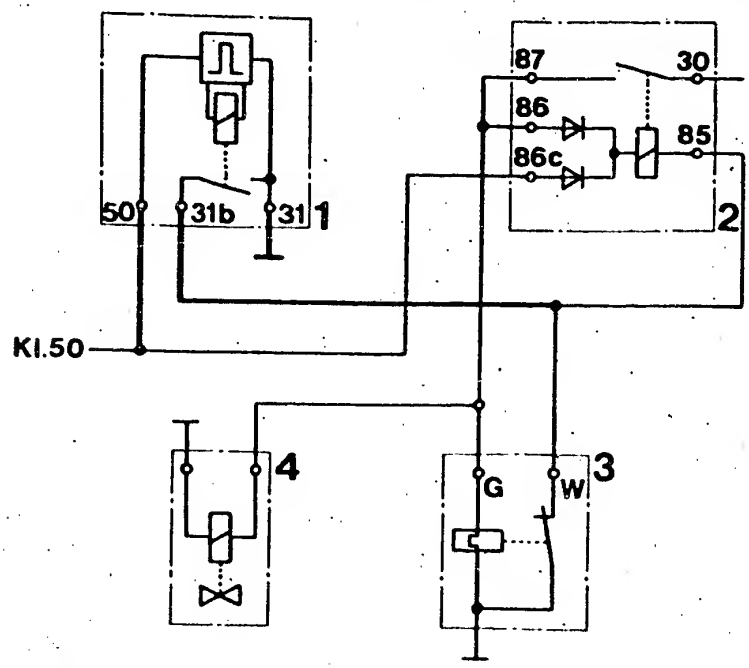
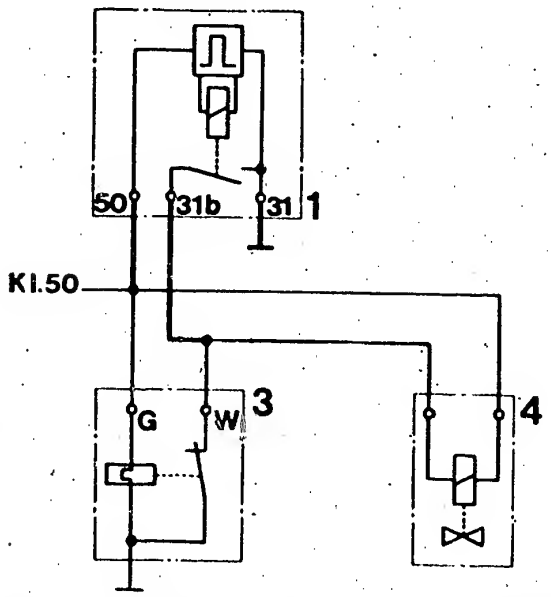


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP
REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

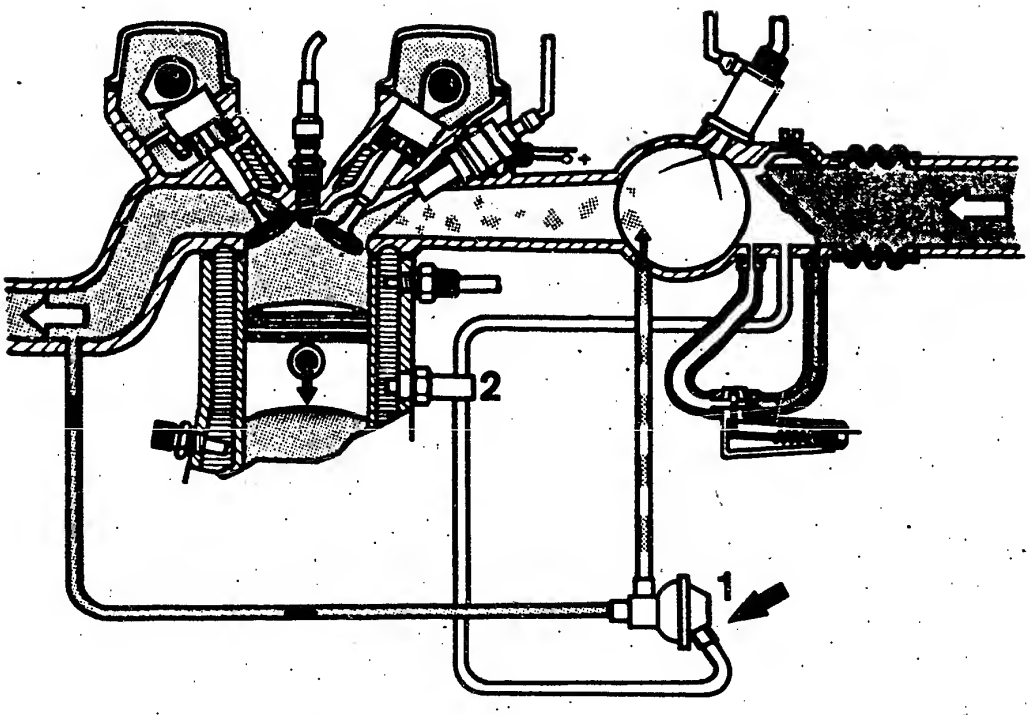
The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

BOSCH
Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

1. Exhaust-gas recirculation (EGR)



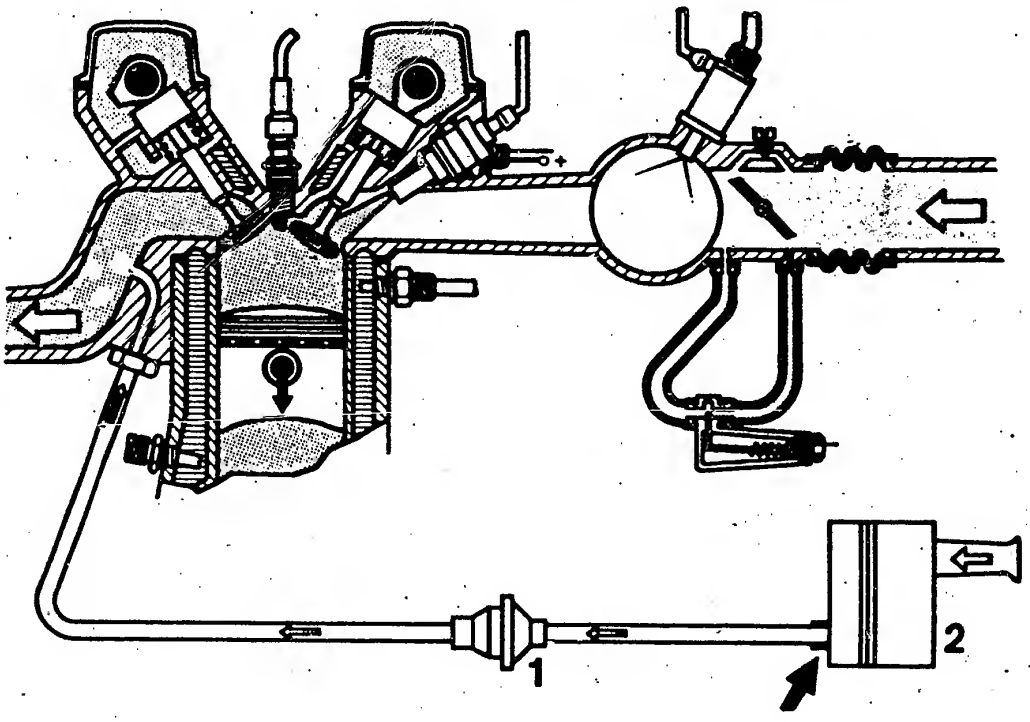
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



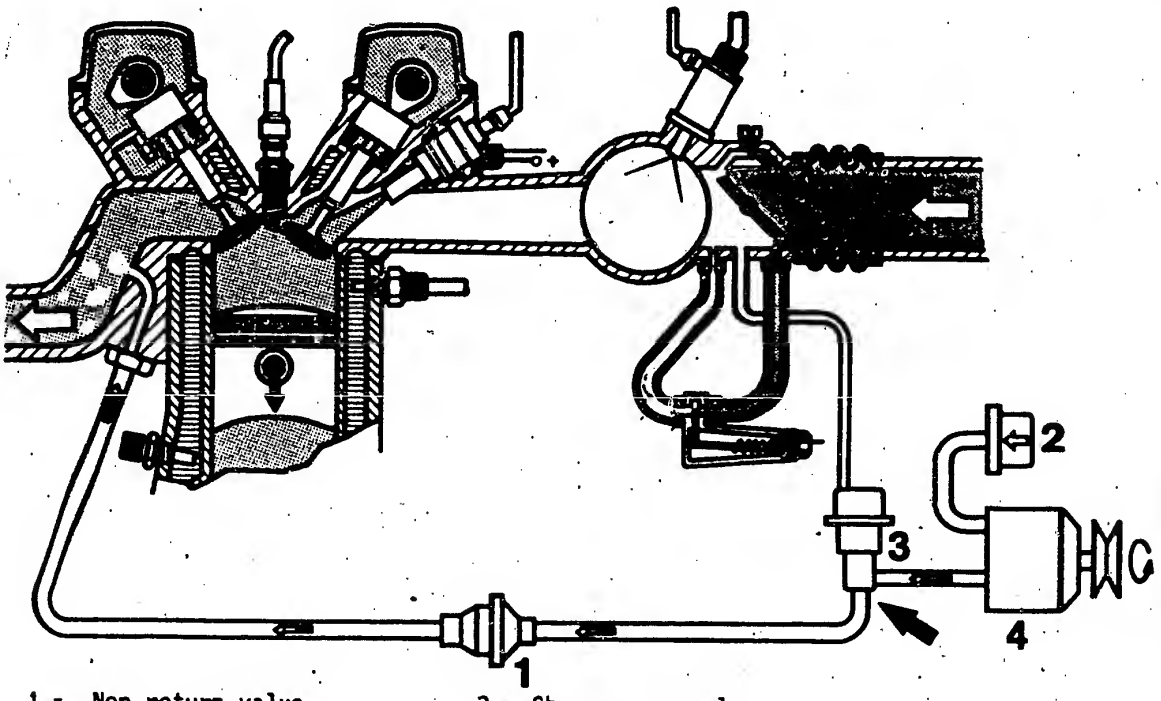
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



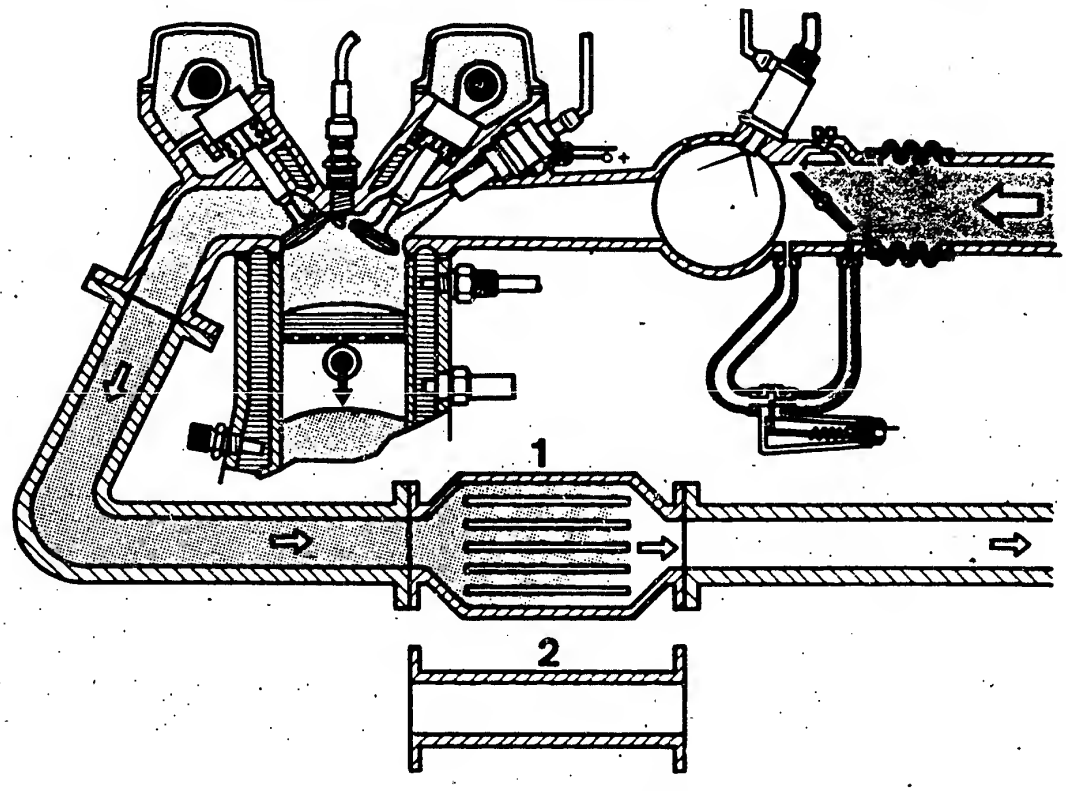
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.

Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

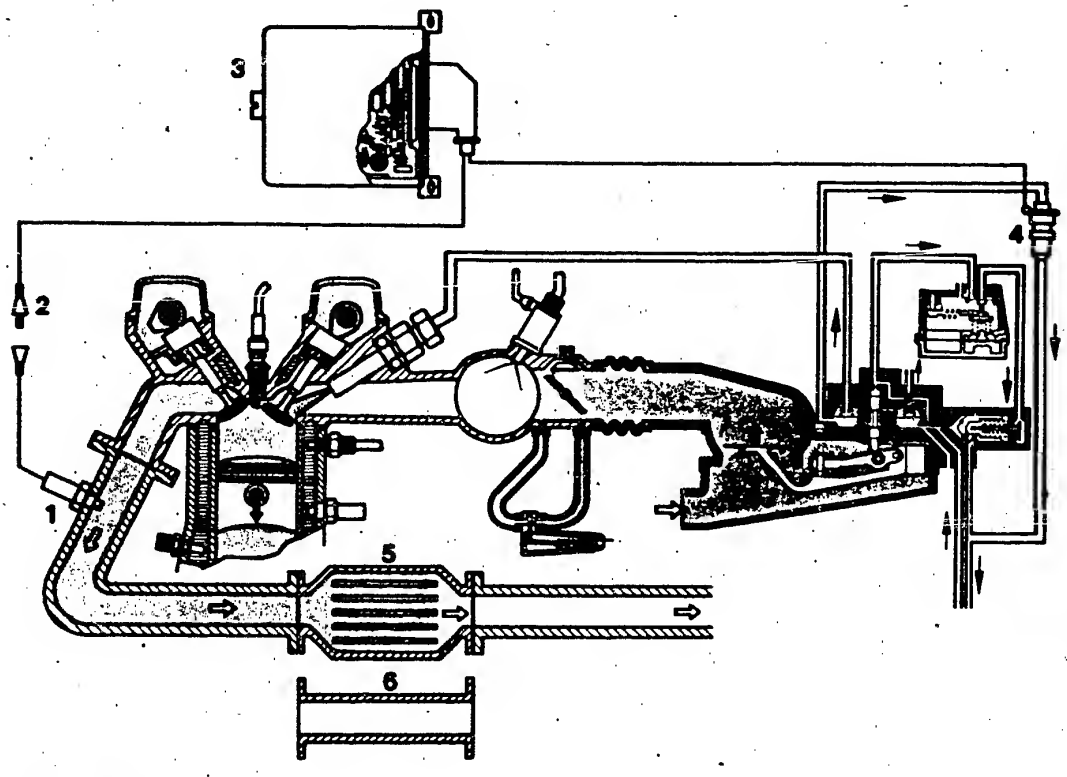
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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